

STRUCTURE OF THE MICROCARD (BASIC INSTRUCTIONS)

A02 = How to use the microcard		1	2	3		4
A01 = Structure of microcard				SIS		
B01 = Trouble-shooting chart	A-	***X*	X*XXX	XXXXX	XXXXX	*XXXX X
	B-	*XXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	C-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	D-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XXX
	E-	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX XX
	F-	XXXXX	XXXXX	XXXXX	XXX	
	G-	XXXXX	XXXXX	XXXX		
	H-					
	J-					
	K-					
	L-					
	M-					
N01 = Service Information	N-	*XXXX	XXXXX	XXXXX	XXX	XX XX*
		12345	67890	12345	67890	12345 678
			1		2	

Index

N28 = Table of contents and publication information


- 1 = Special features
- 2 = Safety and precautionary measures
- 3 = Test equipment and tools
- 4 = Installation position of components

- a. Read from left to right.
- b. Title of micropicture (appears on each coordinate).

E16	Product/component/test step	
	Coordinate	

c. Limits of section

			
Beginning	Mid-section	End	One-page section

A01		
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SPECIAL FEATURES

This microcard contains the trouble-shooting instructions valid at the time of publication for the following model:

* Mercedes-Benz Type W 124 (1.1985->)

ABS with 3 wheel-speed sensors and 3 hydraulic channels.

Testing using the ABS2 LED tester.

A02		
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TEST SPECIFICATIONS

For safety reasons, the ABS must be tested only with the ABS tester. The rapid diagnosis chart contains all important test specifications as well as notes on testing and trouble-shooting.

TEST CONDITIONS FOR TESTING WITH ABS 2 LED TESTER

- * Correct size of tire mounted?
- * Check ground connection of overvoltage-protection relay term.31 for security and corrosion.
- * Check hydraulic connections and joints on hydraulic modulator for leaks (visual examination, arrows).
- * If during driving the ABS warning lamp comes on occasionally (e.g. after switching on electrical devices) and goes out again by itself, check battery and power supply (alternator, regulator and voltage drops)
- * If the ABS warning lamp is continuously lit and does not go out, check the following points:
 - Is multiple plug correctly seated on controller and has it latched in?
 - All plug-in contacts O.K.?
 - Spring contacts latched in?
 - Check installation position of seal ring in controller plug for correct seating: round section to bottom.

- Check wheel-speed sensor leads at controller plug for correct assignment:

Wheel-speed sensors:

Front left - term. 6 and term. 4.
Front right - term. 21 and term. 23.
Rear left - term. and term. .
Rear right - term. and term. .

- V-belt torn?
(Alternator does not supply voltage, charging and ABS warning lamp light up).
- * Connect ABS7-LED tester to ABS wiring harness.
- Only detach and connect controller with ignition off.
- For test purposes, switch on ignition in all program switch settings (tester runs on power supplied by vehicle battery).
- Observe LED (green) for power supply in all program switch settings.

I M P O R T A N T !

Do not drive with the tester connected!
The entire test program is to be repeated whenever repairs have been carried out.
The ABS system is a vehicle safety system.
Work on this system require detailed knowledge of the system.
The conventional brake system must be working properly.

General trouble-shooting information:

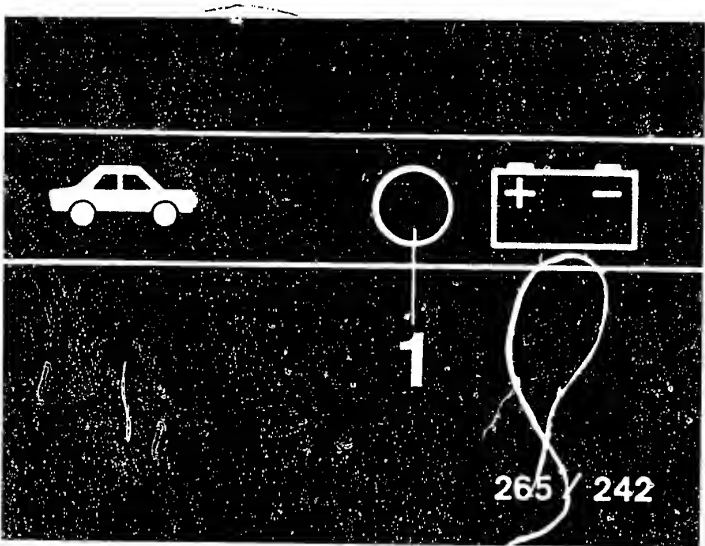
Check all leads for short-circuit to ground and contact with positive leads, as well as for rubbing and pinching.

RAPID DIAGNOSIS CHART FOR ABS2 LED TESTER

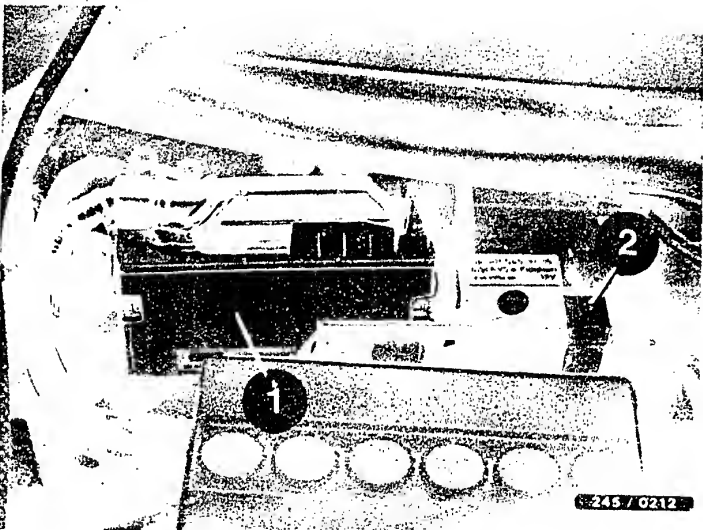
Do not run with tester connected!

Program-selector-switch position 1 to 6

Test on (measurement at terminals)	Additional operation	Test specification (reading)	Possible causes of trouble (see coordinate)
Power supply (Term.1 and term.20)	Ignition on	LED 1 (upper illustration) lights up continuously	<ul style="list-style-type: none">* Fuse in over-voltage protection relay defective (C01)* Battery insufficiently charged (C03)* Voltage drops too high (C03)* Over-voltage protection relay defective (C03)* Check lead to driving switch term. 15.

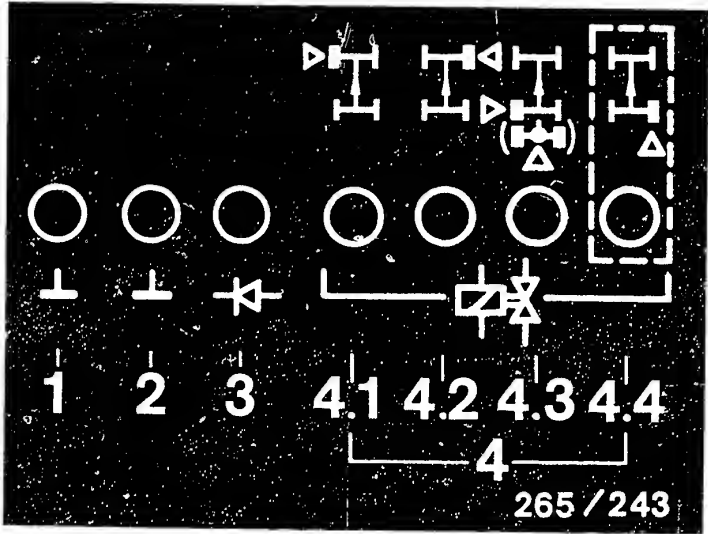


1 = ABS controller
2 = Over-voltage protection relay

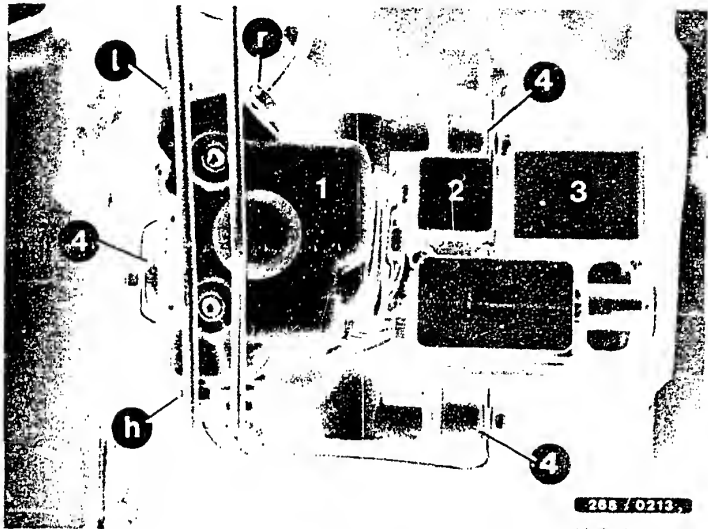


Program-selector-switch position 1 (3-duct hydraulic modulator)

Test on (measurement at terminals)	Addit- ional operation	Test specification (reading)	Possible causes of trouble (see coordinate)
Ground (term.10, term.34) Diode for warning lamp (term.29, term.32) Solenoid-operated valve internal resistances (term.2, term.18, term. , term.35) Off-position and ground of valve relay ABS warning lamp	Ignition on	6 LEDs (1 to 4.3) light up equal- ly brightly (upper ill.) ABS warning lamp in vehicle must light up	<p>* LED 1 and / or 2 (upper illustration) do not light up: Check ground terminals for short circuit. (C05, C07)</p> <p>* LED 3 (upper illustration) does not light up: diode defective, check ground of valve relay. (C07, C09)</p> <p>* One or more LED 4 do not light up: Check corresponding plug connection for solenoid-operated valve and leads. (C09)</p> <p>Solenoid-operated valve, internal resistance 0,7...1,7 Ω</p> <p>* All LED 4 and LED 3 do not light up: Check ground of valve relay, valve relay defective. (C09)</p> <p>* Weak lighting of a LED means contact resistance in corresponding current path. (C09)</p> <p>* ABS warning lamp does not light up: warning lamp defective. Note: all other 6 LEDs light up (B03)</p>



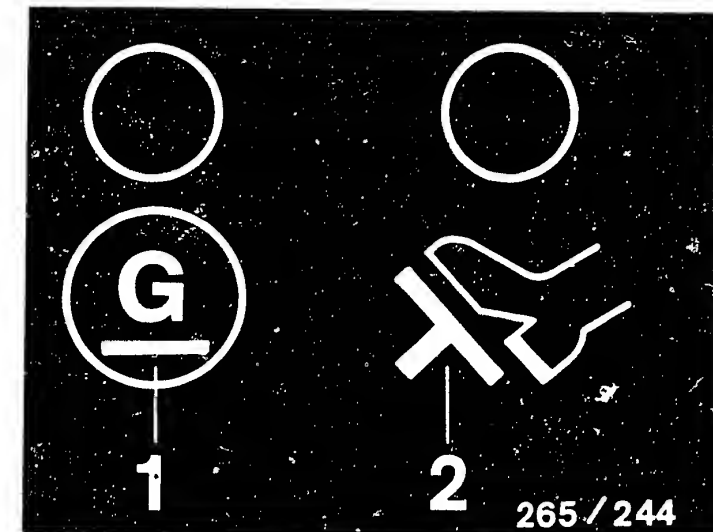
- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts



RAPID DIAGNOSIS CHART (CONTINUATION 2)

Program-selector-switch position 2

Test on (Measurement at terminals)	Additional operation	Test specification (reading)	Possible causes of trouble (see coordinate)
Generator voltage of term. 61 term. 15)	Ignition on	LED 1 (upper illustration) lights up.	* LED sometimes goes out only after snap acceleration (test is then O.K.) (C17)
	Start engine	LED 1 (upper illustration) goes out with engine running	* Check lead to generator term. 61 * Generator defective.
Stop-lamp switch (term. 25)	Ignition on	LED 2 (upper illustration) lights up	* Stop-lamp switch defective. (C19) * Check lead to stop-lamp switch.
	Actuate brake pedal	LED 2 (upper illustration) goes out	* Lead at stop-lamp switch incorrectly connected.

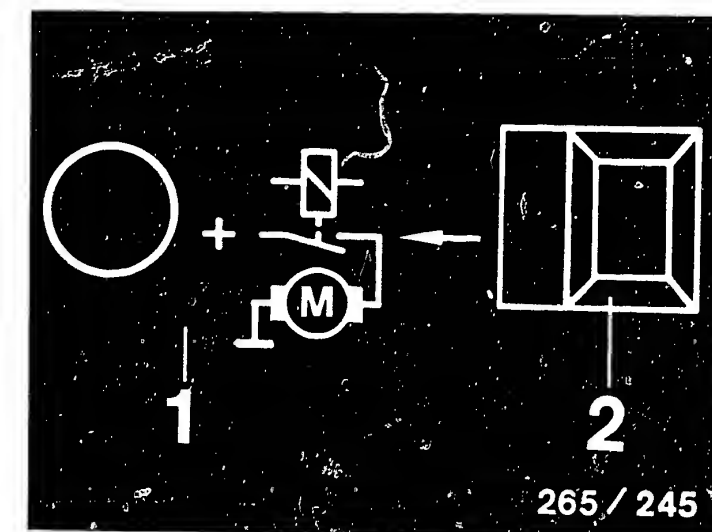


Rapid diagnosis chart (Continued 3)

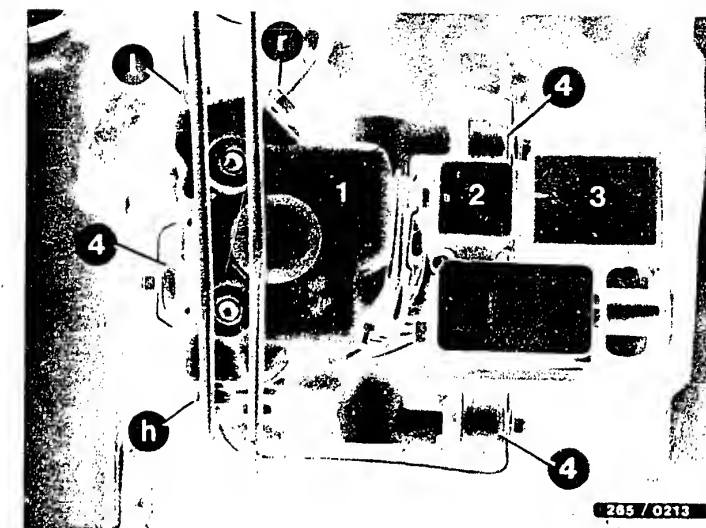
Program-selector-switch position 3

Test on (measurement at terminals)	Additional operation	Test specifications (reading)	Possible causes of trouble (see coordinate)
Motor relay, pump motor in hydraulic modulator (term.28 and term.14)	Ignition on, constantly press push- button 2 (upper ill- ustration)	LED 1 lights up, pump motor runs. After releasing push-button, LED stays lit due to run-on of motor (upper illustration).	<ul style="list-style-type: none"> * Motor relay defective (C21) * Check ground and positive terminal of hydraulic modulator (C23) * Check leads from controller term.14 and term.28 to hydraulic modulator term.9 or term.11. (C23) * Pump motor defective (C23)

Program-selector-switch position 4 not applicable

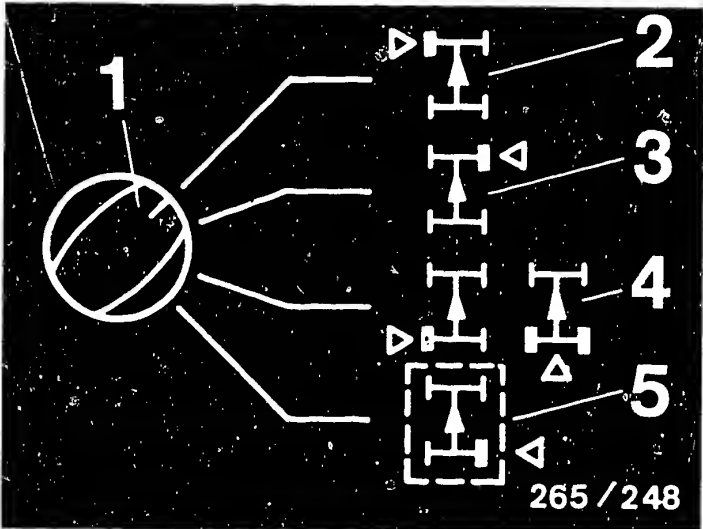
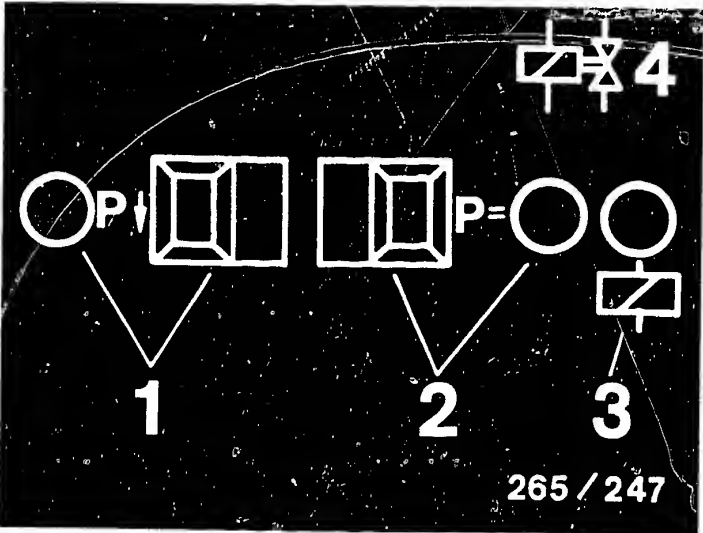


- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts



RAPID DIAGNOSIS CHART (CONTINUED 4)
 Program-selector-switch position 5 (3-channel hydraulic modulator)

Test on (measurement at terminals)	Additional operation	Test specification (reading)	Possible causes of trouble (see coordinate)
Valve relay op. (term.27)	Ignition on	LED 3 (upper illustration) lights up	*Valve relay (winding) or leads defective (D03)
Solenoid-operated valves in hydraulic mod. for function and mix-up. NOTE: Check each wheel separately in turn. Keep to operating sequence!	Chock up vehicle. Ignition on. The wheel being tested must be freely turnable by hand. Set switch 1 for wheel selection to wheel to be tested. (Lower ill.)		* Repeat test with engine running * Valve relay (make contact) defective (D03) * Brake in line from valve relay term.87 to B+ (D03) * Brake leads at hydraulic modulator mixed up (D07)
Operation pressure holding	1. Constantly press push-btn P= (upper ill.)	LED P= (upper ill.) lights up	* Current value not obtained (LED P arrow or P= goes out; upper illustration): Battery insufficiently charged. Repeat test with engine running. (D07)
	2. Constantly press brake pedal	Wheel turnable by hand	
	3. Release push- button P= (upper ill.)	LED P= goes out (upper ill.) Wheel locks	
Operation pressure reduction	4. Press push- button P arrow (upper illustration)	LED P arrow (upper ill.) lights up, wheel turnable by hand	* Solenoid-op. valves correct- ly connected electrically? Wheel, front left:term.2 Wheel, front right:term.35 Wheel, rear left:term.- Wheel, rear right:term.- Rear axle:term.18 (D07) * Hydraulic modulator defective (D09)
	5.Release push- button P arrow (upper ill.)	LED P arrow (upper ill.) goes out, wheel locks	
	6.Release brake pedal		

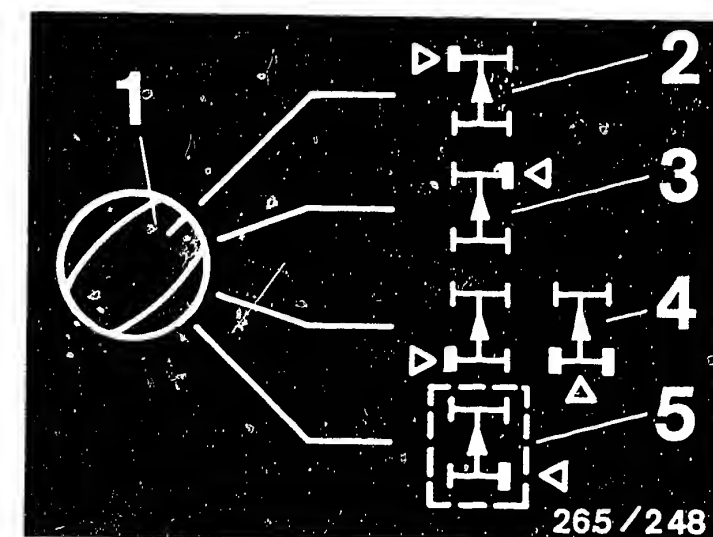
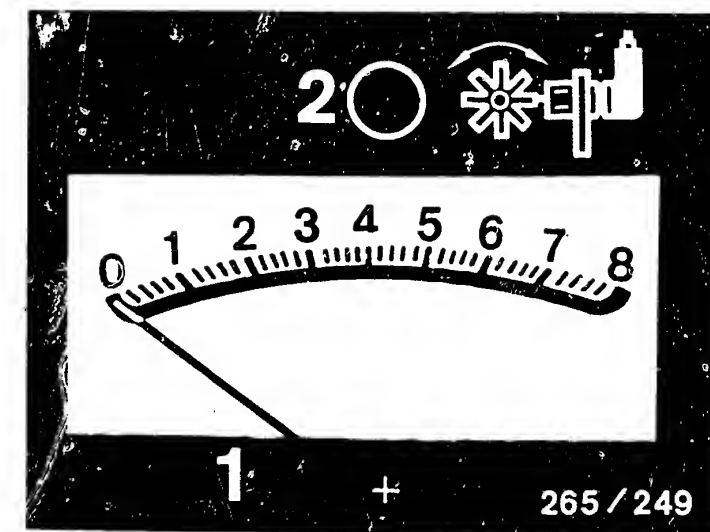


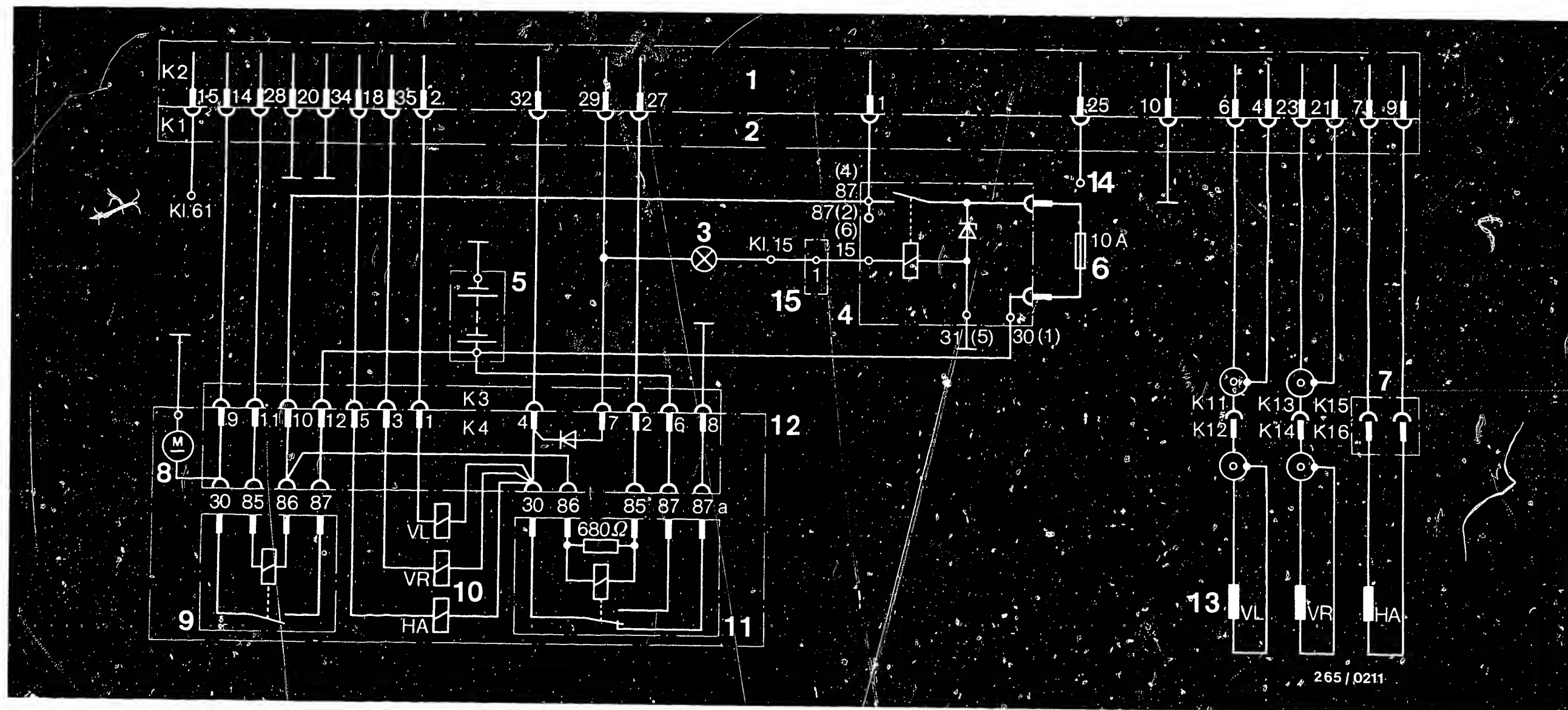
RAPID DIAGNOSIS CHART (CONTINUED 5)

Program-selector-switch position 6 (3 wheel-speed sensors)

Test on (measurement at terminals)	Additional operation	Test specification (reading)	Possible causes of trouble (see coordinates)
<p>Wheel-speed sensor for operation and mix-up</p> <p>NOTE: Check each wheel separately in turn.</p> <p>Test of the rear axle may be performed at either left or right wheel.</p> <p>(Wheel, front left: term.6 and term.4)</p> <p>Wheel, front right: term.23 and term.21</p> <p>Rear axle: term.7 and term.9)</p>	<p>Chock up vehicle. Ignition on.</p> <p>The wheel being tested must be freely turnable by hand.</p> <p>When testing the driven axle, the wheel not being tested must be locked.</p> <p>Set switch for wheel selection to wheel to be tested. For the rear axle, set to position 4 (lower illustration).</p> <p>Turn wheel by hand until LED 2 above instrument lights up without flickering. (Wheel speed approx. 1 revolution per second). Afterwards, read off indication at instrument (upper illustration):</p>	<p>1. Smallest reading large 1,0 divisions</p> <p>2. Permissible fluctuation max. 25 % of largest reading.</p>	<ul style="list-style-type: none"> * Wheel-speed-sensor lead mixed up (D17) * Break in wheel-speed-sensor lead (D17) * Wheel-speed sensor defective (D19) Winding resistance Front axle: →4.85: 0,9...2,3 k Ω 4.85→: 0,6...1,6 k Ω Rear axle: 0,6...1,6 k Ω * Air gap between wheel-speed sensor and ring gear too wide (D19) * Ring gear defective or loose. (D19) * Ring gear with incorrect no. of teeth installed Front axle: 96 teeth Rear axle: different number of teeth on Cadan shaft depending upon transmission ratio (D15) * Wheel-bearing clearance too great

Take for road test for final check. With the engine running, the warning lamp must go out. Drive at at least 30 km/h. The warning lamp must not light up again!



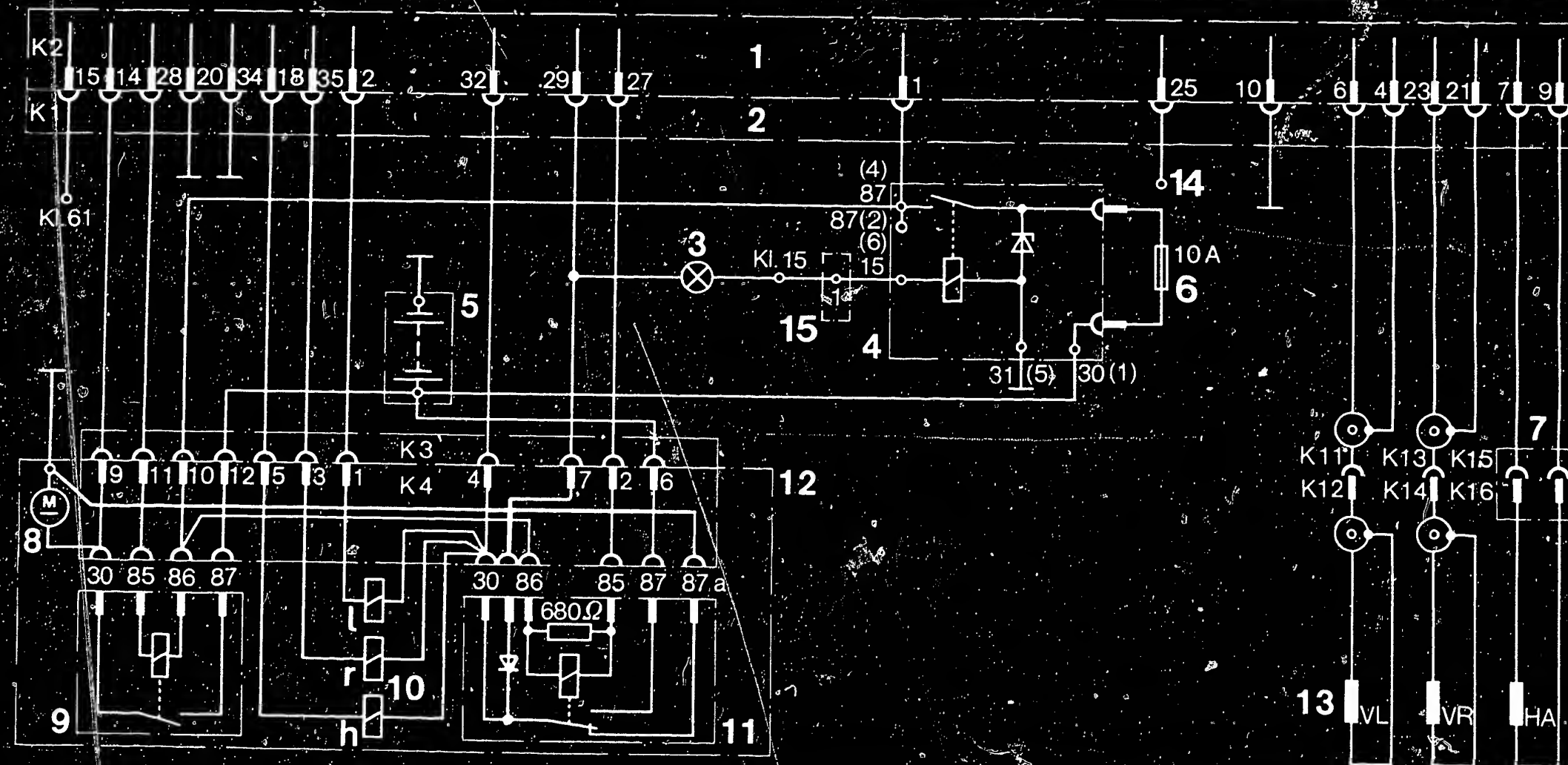


ELECTRICAL TERMINAL DIAGRAM → 8.85

- 1 = ABS controller
- 2 = Controller plug
- 3 = ABS warning lamp
- 4 = Over-voltage protection relay
- 5 = Battery
- 6 = Fuse
- 7 = Multiple butt connector
- 8 = Return-supply-pump motor
- 9 = Motor relay

- 10 = Solenoid-operated valves
- 11 = Valve relay
- 12 = Hydraulic modulator
- 13 = Wheel-speed sensor
- 14 = To stop-lamp switch (+)
- 15 = Plug connection, 12-pin

- l = Front left
- r = Front right
- h = Rear axle
- K1 to K16 = ABS plug connections



ELECTRICAL TERMINAL DIAGRAM 8.85->

- 1 = ABS controller
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- 10 = Solenoid-operated valves
- 11 = Valve relay
- 12 = Hydraulic modulator
- 13 = Wheel-speed sensor
- 14 = To stop-lamp switch (+)
- 15 = Plug connection, 12-pin

- l = Front left
- r = Front right
- h = Rear axle
- K1 to K16 = ABS plug connections

TEST EQUIPMENT AND TOOLS

Designation	Code	Part number
ABS2 LED tester	KDAS 0003	Procure. address: Robert Bosch GmbH KH/VKD 3 Postfach 41 09 60 7500 Karlsruhe 41
Adapter lead (included in scope of delivery of tester)	KDAS 0003/2	
Charging and bleeding device		e.g. ATE Part No. 3.9302-1000.4 1)
Bleeder fitting for connection of charging and bleeding device to fluid reservoir of brake master cylinder		ATE Part No. 3.9302.0702.2 1)
Bleeder hose		ATE Part No. 3.3590.2300.1 1)
Auxiliary hose		ATE Part No. 3.9302.0704.2 1)
Brake-pedal-actuating device		ATE Part No. 3.9312.0100.4 1)

1) = obtainable from: Alfred Teves GmbH,
Guerickestr. 7
D-6000 Frankfurt (Main)

Test equipment and tools (continued)

Designation	Code	Part number
Pressure tester Tester for checking low- pressure and high- pressure at hydraulic brake systems		e.g., ATE Part No. 3.9305-0200.4 1)
Flat double-end flare nut wrench, 9 x 11 mm		Hazet Part No. 612 2)
Container, approx. 1l for catching the brake fluid		
Brake fluid Use only DOT 4 or brake fluid from the vehicle manu- facturer.		
Electrics tester or multimeter for trouble- shooting	ETE 014.00	0 684 101 400 commercially available

Aids!

Use only original brake lines from the vehicle manu-
facturer!

Grease for wheel-speed sensor	Molykote Longterm 2
Protective caps for brake lines	1 900 508 002 (100 pieces)
Protective caps for brake-line connections at hydraulic modulator	1 900 508 004 (100 pieces)

1) obtainable from: Alfred Teves GmbH Guerickestr. 7
D-6000 Frankfurt (Main)

2) obtainable from: Hazet Co, D-5630 Remscheid

For production reasons:
continued on the following
coordinate.

INSTALLATION POSITION OF COMPONENTS

Details of the installation position are always
with reference to the forward direction of travel.

- * ABS warning lamp:
In instrument panel.
- * Wheel-speed sensors, front axle:
One on both sides in the steering knuckles
- * Wheel-speed sensors, rear axle:
One wheel-speed sensor on the rear-axle housing.
- * Hydraulic modulator:
In the engine compartment, front left.
- * Controller:
In the engine compartment on the right,
behind the battery.
- * Over-voltage protection relay:
In the engine compartment on the right, near the
controller.
- * Ground terminal:
Behind the combination instrument, on the left down low,
near the plug connections of the central electrics.

LEAKAGE CHECK ON THE BRAKE SYSTEM

After exchanging the hydraulic modulator, bleed the brake system and carry out low-pressure and high-pressure tests.

	High-pressure test	Low-pressure test
Line test pressure		
Overpressure:	50...90 bar	3 bar
Test duration:	5 minutes	2 minutes
Pressure drop from set value:	5 % (max.)	0 %

NOTE:

The leakage check must be performed for both brake circuits.

GENERAL INFORMATION FOR REPAIRS AND ON BRAKE SYSTEM

The ABS is basically maintenance-free, however, when working on vehicles with ABS system the following must be noted:

1. When welding with electric welding equipment, pull plug from electronic controller.
2. When painting, the electronic controller may be loaded for a short time to max. + 95°C and for a long time (approx. 2 hours) to max. + 85°C.
3. After exchange of hydraulic modulator, controller, wheel-speed sensor and of the wiring harness, as well as after work in which the ABS units are touched (e.g. accident repairs), check the complete ABS system with the tester.
Pay attention to correct assignment of brake lines and wheel-speed sensor connections at controller as well as wheel-speed-sensor plug connections (see vehicle-specific terminal diagram).
4. Each time after working on the brake system, the latter must be bled and go through low-pressure and high-pressure tests. Check all connections for leaks.
5. Tighten battery terminals to terminal posts of battery.
6. Do not use a fast charger for starting the engine.
7. Never disconnect the battery from the vehicle electrical system when the engine is running.

8. When fast charging, disconnect the battery from the vehicle electrical system.
9. Take care that all connectors of the wiring harness are seated perfectly.
10. Never disconnect or connect the ABS wiring-harness plug from the controller when the ignition is switched on.
11. For reasons of safety, the hydraulic modulator must never be repaired, but be exchanged only as a complete unit.

Excepted from this are the motor relay and the valve relay.

Both relays may be exchanged.

Apart from the brake-line connections, no screws at the hydraulic modulator may be loosened.

Once they are loosened, it is impossible to make the brake circuits leak-free ever again!

There is danger to life !

Caution when handling brake fluid!

- a) Fill brake fluid only into containers from which no one would mistakenly drink the fluid.
(D a n g e r - p o i s o n o u s !)
- b) Even slight traces of mineral oil leads to failure of the brake system. Take particular care with respect to colorless through to yellow-dyed brake fluid, since the danger of a mix-up is in this case greatest. If mineral oil is found in the brake system or there is suspicion of this being the case, thoroughly flush out the complete brake system with brake fluid. In addition, replace the main cylinder.
- c) Do not allow brake fluid to come into contact with the vehicle paintwork, since the fluid contains elements which act as solvents for paint.
- d) Brake fluid is highly hygroscopic, i.e. it absorbs moisture from the air, which lowers its boiling point. For this reason, store brake fluid only in well-sealed storage containers.

Note:

During the course of the service life of brake fluid, its boiling point drops through continuous absorption of moisture from the atmosphere. In the case of very high loading of the brakes, vapor bubbles may therefore develop in the brake system.

Therefore, replace the brake fluid once a year, preferably in Spring.

OPERATION AND TESTING OF THE ABS WARNING LAMP

A vehicle equipped with ABS comes into the workshop with one of the following customer complaints:

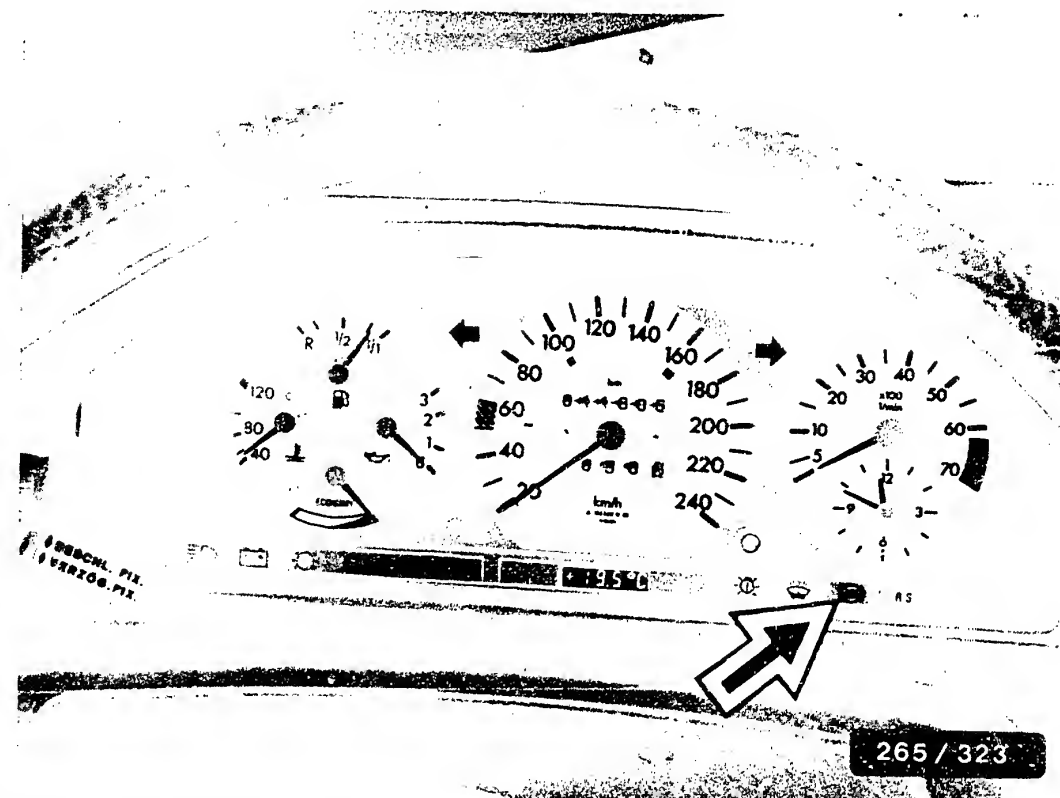
- * Warning lamp does not light up after switching on ignition.
- * Warning lamp does not go out after reaching idle speed.
- * Warning lamp lights up again while driving or lights up occasionally.

Make sure of the circumstances before checking the complete ABS system with the ABS tester.

For reasons of safety, testing of the ABS is permitted only with the ABS tester.

When connecting the ABS tester, just as when disconnecting and connecting the controller, the ignition must always be switched off.

The following gives information about the functioning and malfunctioning of the ABS warning lamp.



ABS = ABS warning lamp in instrument panel

ABS warning lamp

When the ignition is switched on, the warning lamp, marked with the letters "ABS", lights up.

When the engine starts and reaches idle speed the ABS warning lamp goes out (terminal 61 of generator supplies voltage to ABS controller). As soon as all 4 wheels of the vehicle exceed a speed of approx. 6 km/h for the first time after starting, the ABS system tests itself automatically (BITE sequence).

This procedure is repeated every time the ignition is switched off and the engine started up again. In addition, the ABS constantly tests itself to a certain extent while the vehicle is travelling.

Incorrect warning-lamp indications are:

- * Warning lamp does not light up after switching on ignition.
- * Warning lamp does not go out after reaching idle speed.
- * Warning lamp lights up when driving or lights up occasionally.

Lighting-up of the ABS warning lamp indicates to the driver that the ABS is defective.

Nevertheless, braking can still take place with the conventional brake system.

However, it is possible for the wheels to lock.

General information:

Occasional lighting up of the warning lamp may be brought about through the battery being insufficiently charged.

The lamp lights up only as long as there is under-voltage, e.g. after switching on consuming devices when at idle.

The causes of trouble can be determined with the assistance of the ABS tester.

OPERATION OF THE ABS2 LED TESTER

1. General

The BOSCH ABS2 LED TESTER checks the ABS components in a passenger car with hydraulic brake system.

The following BOSCH ABS systems can be checked:

- * All ABS 2 versions (at present, ABS 2, ABS 2 B)
- * ABS 2 B-function of the electronic traction control (ETC)

The tester checks the peripheral system components in 6 program steps:

- * Hydraulic modulator
- * Motor relay
- * Valve relay
- * Wheel-speed sensors
- * Warning lamp
- * Acceleration sensor
- * Wiring harness
- * Plug connections
- * Ground cables
- * Stop-lamp switch signal
- * Generator signal

The ABS controller is not tested.

Self-diagnosis within the ABS controller makes additional testing of the controller with the tester unnecessary.

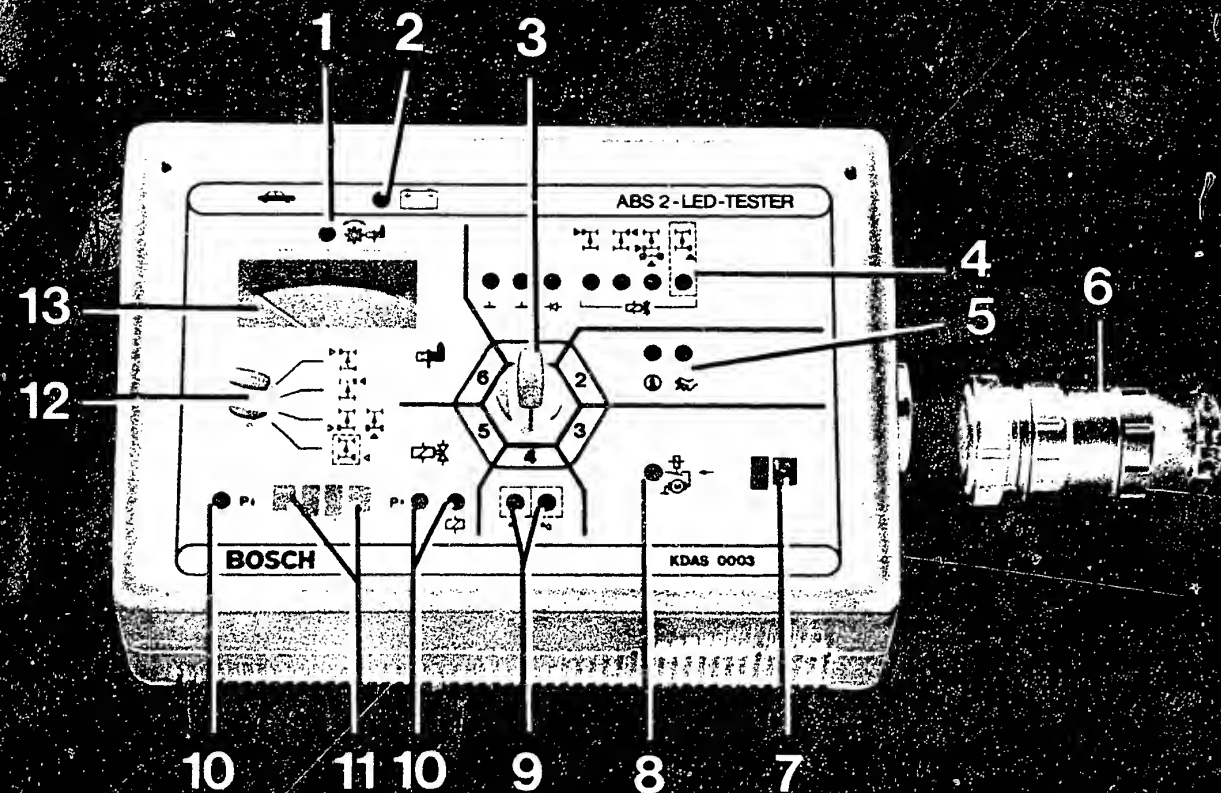
A brake test bench is not required for testing the ABS.

If a brake test bench is used, there is a danger of the vehicle jumping off the rollers!

Responsibility lies with the testing personnel if a brake test bench is used.

2. Structure of tester

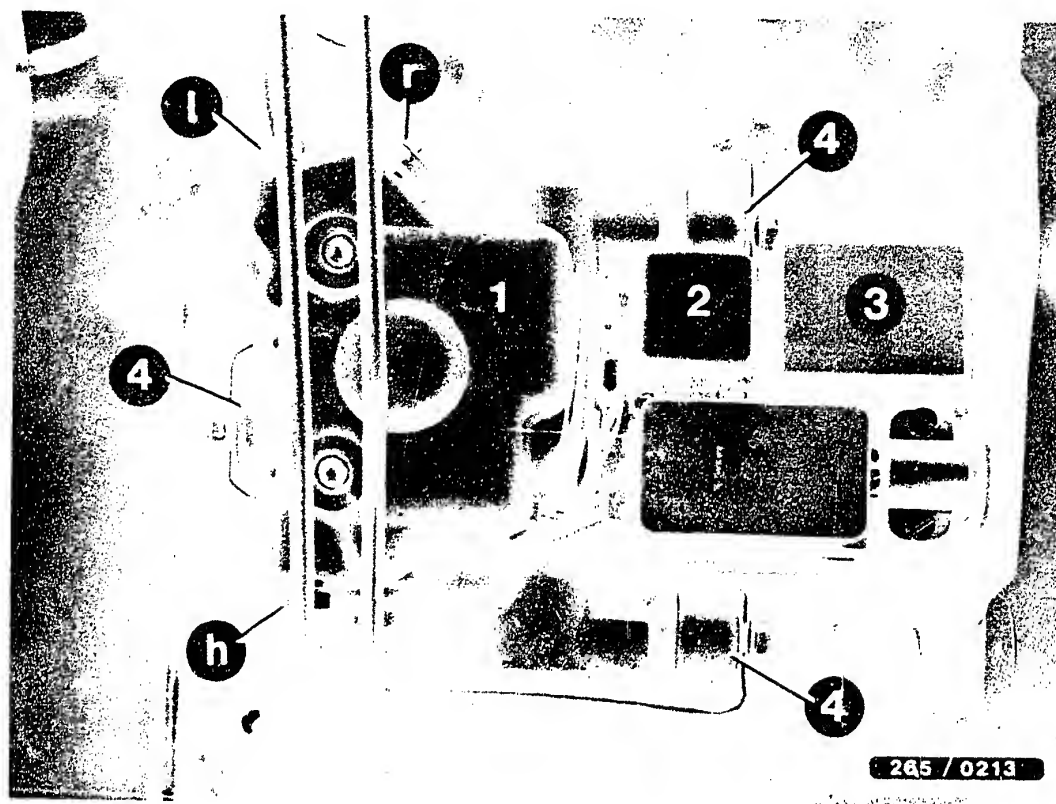
Failure is indicated by light-emitting diodes (LEDs), with the exception of wheel-speed sensor signals which are read off at the indicating instrument.



265/241

- 1 = 1 LED indicator for wheel speed in program-selector-switch position 6
- 2 = 1 LED indicator for battery voltage
- 3 = Program switch
- 4 = 7 LED indicators for program-selector-switch position 1
- 5 = 2 LED indicators for program-selector-switch position 2
- 6 = ABS adapter lead for connection to ABS wiring harness in vehicle
- 7 = Push-button for motor-relay control in program-selector-switch position 3
- 8 = 1 LED indicator for program-selector-switch position 3
- 9 = 2 LED indicators for program-selector-switch position 4
- 10 = 3 LED indicators for program-selector-switch position 5
- 11 = 2 push-buttons for tripping solenoid-operated valve functions.
Pressure-holding and pressure-release in program-selector-switch position 5
- 12 = Rotary switch for selection of individual wheels.
Functional in program-selector-switch position 5 and 6
- 13 = Indicating instrument for program-selector-switch position 6

Structure of tester (Continued)



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

TEST REQUIREMENTS FOR TESTING USING ABS2 LED TESTER

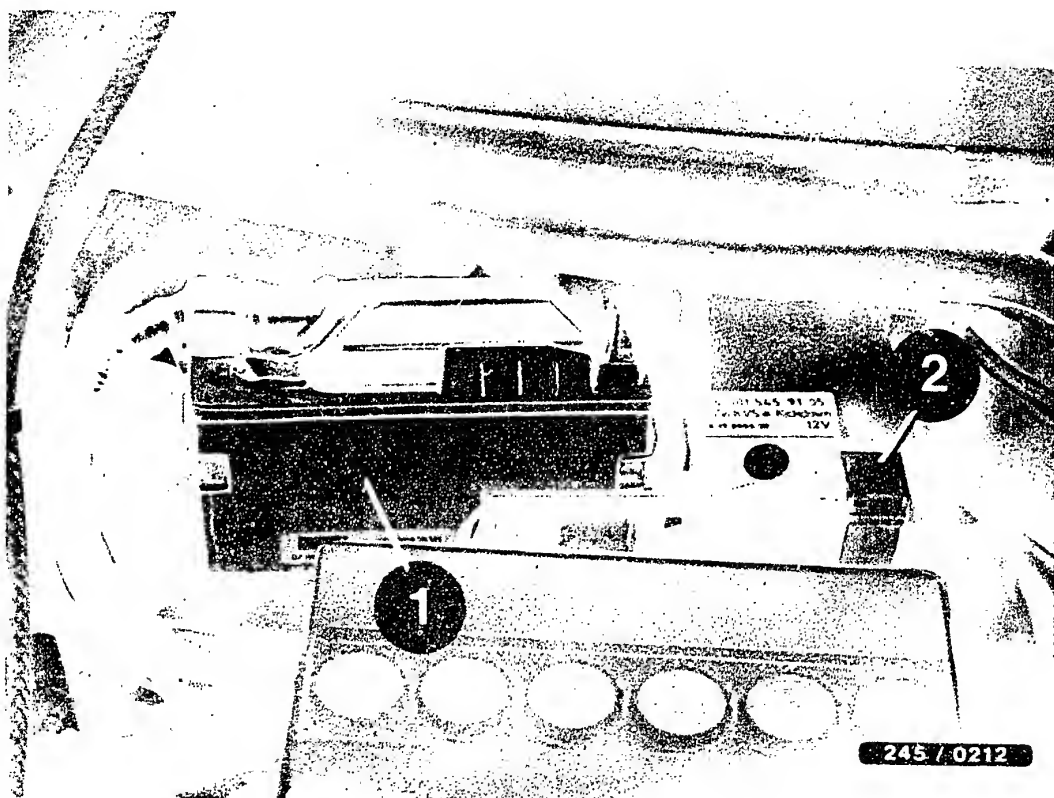
- * Regulatory tire size fitted?
- * Check for firm seating of ground of return-supply pump.
- * Check for firm seating of ground strap between engine block and vehicle frame.
- * Check for leaks in hydraulic connections at hydraulic modulator and sealing points (arrows) (visual examination).

* If the ABS warning lamp lights up intermittently when driving (e.g. after switching on consuming devices) and goes out again by itself, check the battery and power supply (generator, regulator and voltage drops).

* If the ABS warning lamp lights up constantly and does not go out, check the following points:

→ Controller plug sitting correctly on controller and latched?
All plug contacts O.K.?
Spring contacts latched?

→ V-belt snapped? (Generator provides no voltage, charge-indicator lamp and ABS warning lamp light up).



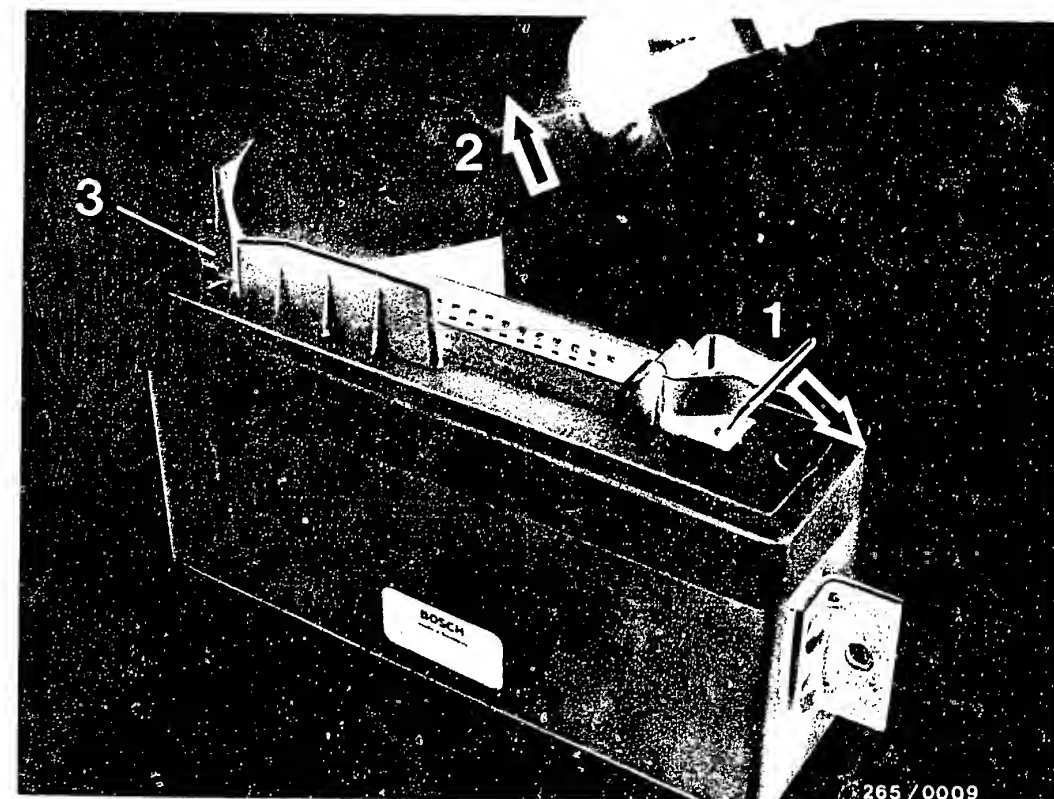
- 1 = Controller for ABS
- 2 = Over-voltage protection relay

* Connect LED tester to ABS wiring harness.

ATTENTION!

Disconnect and connect controller only when the ignition is switched off.

The controller is installed in the engine compartment on the right, behind the battery.



- 1 = Spring
- 2 = Controller plug (35-pin)
- 3 = Coding unit

Switch off ignition before disconnecting controller plug.

Push back spring, pivot controller plug upwards and disconnect from coding unit.

* For checking with tester, switch on ignition in all program-selector-switch positions (tester operates with current supply from vehicle battery).

* One LED (green) indicates whether the voltage is sufficient.

Caution!

Do not run with tester connected!

After each repair, repeat the complete test program.

General note for trouble-shooting

Check all leads for short circuit to ground and contact with positive leads and watch out for rubbed and pinched locations.

For production reasons:
continued on the following
coordinate.

TEST CHART FOR ABS 2 LED TESTER

TEST STEP 1

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/Operation

Voltage supply (term. 20 and term. 1)

N>

* Operation: Position:

Program switch	all
Push-button	-

* Operation in vehicle:
Ignition on.

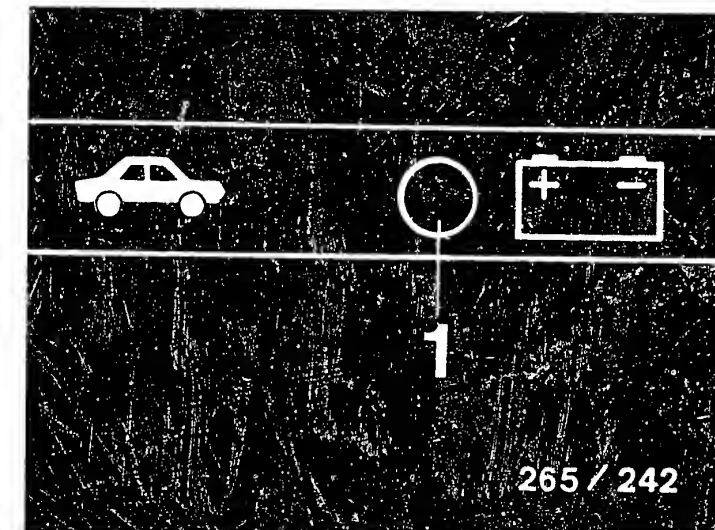
* Test specification (indication)
LED 1 (upper illustration) lights
up continuously in all program-
selector-switch positions.

Trouble-shooting:

Switch off ignition!

No reading:

- * Controller plug not connected properly.
- * Fuse in over-voltage protection relay defective.
- * Over-voltage protection relay defective: exchange.



1 = LED for supply voltage

1 = ABS controller
2 = Over-voltage protection relay



Continued C05

Continued on next coordinate

C01

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C02

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TEST STEP 1 (CONTINUED)	(TEST SPECIFICATIONS AND OPERATING INSTRUCTIONS)
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Check the following leads:

- * Positive lead from B+ to over-voltage protection relay term. 30 (1)
- * Negative lead from over-voltage protection relay term. 31 (5) to ground.
- * ABS ground terminal must be bare metal and must have no contact resistance.
- * Positive lead from over-voltage protection relay term. 87 (4) to controller plug K1/term. 1.
- * Positive lead from over-voltage protection relay term. 15 (6) to driving switch term. 15.
- * Check for firm seating of ground strap between engine block and vehicle frame.



1 = ABS controller
2 = Over-voltage protection relay

LED 1 (green) occasionally lights up during the test procedure:

Interrupt testing and eliminate trouble.

Causes of trouble:

1. Battery insufficiently charged.
Charge battery or leave engine running.
2. Voltage drops at ABS ground terminal too high; ground terminal must be bare metal.

After eliminating the trouble, perform the complete test program.

Component/Operation:

Ground (term. 34, term. 10)
 Diode for warning lamp (term. 29,
 term. 32)
 Solenoid-valve internal resistances
 term. 2, term. 35, term. 18.
 Off-position and ground of valve
 relay.
 ABS warning lamp.

* Operation: Position:
 Program switch 1
 Push-button --

* Operation in vehicle:
 Ignition on.

* Test specification (indication)
 LED 1 up to LED 4.3 light up
 equally brightly (see upper
 illustration).

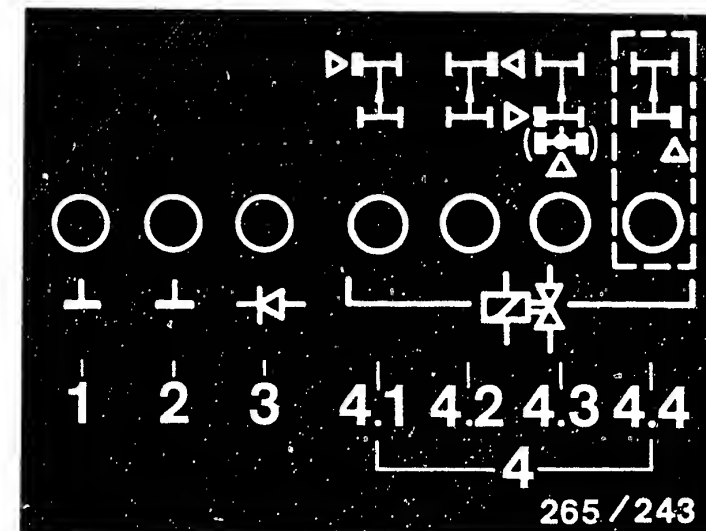
ABS warning lamp in vehicle must
 light up.

Trouble-shooting:

Switch off ignition!

1. LED 1 and/or 2 (upper
 illustration) do(es) not light up:

* Check for firm seating of ground
 terminal behind combination
 instrument as well as ground
 strap between engine block and
 vehicle frame and check for too
 high contact resistance and open
 circuit.



Continued C17

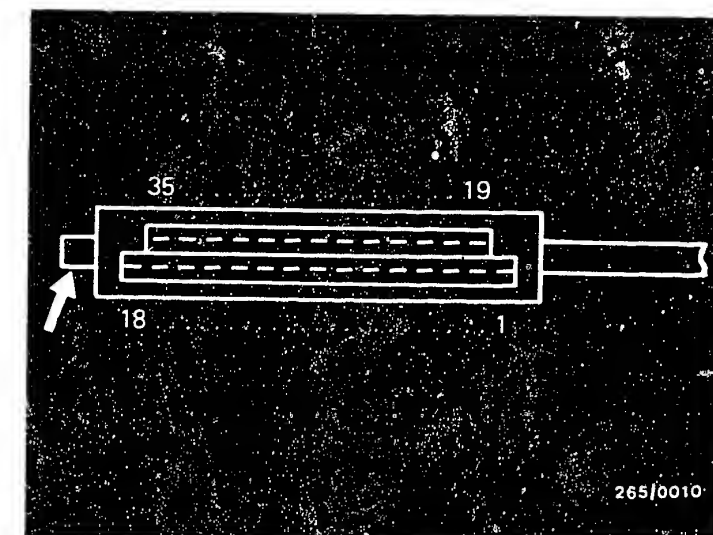
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TEST STEP 2 (CONTINUED) (TEST SPECIFICATIONS AND OPERATING INSTRUCTIONS)

- * Check for contact resistance and open circuit in ground cable from controller plug K1/term.10 to ground terminal.
- * Check for contact resistance and open circuit in lead from ground terminal to controller plug K1/term.34.
- * Valve relay defective.
ATTENTION!
Use only a relay with correct electrical terminal assignment.

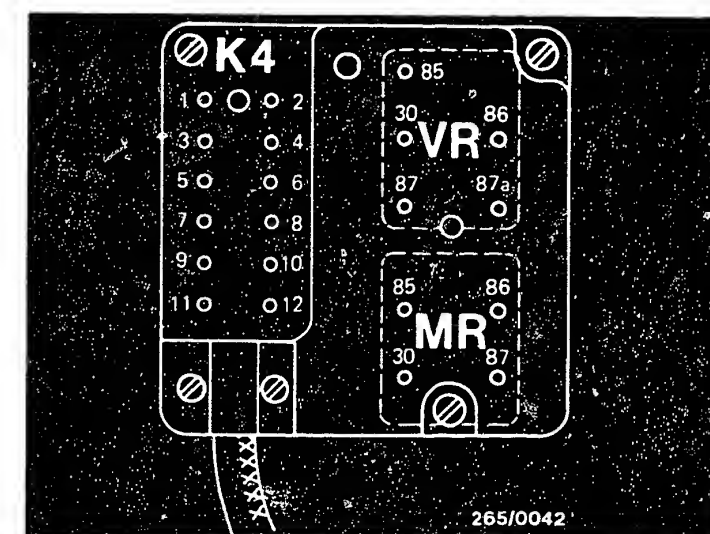
2. LED 3 does not light up:

- * Test diode in forward and reverse directions using ohmmeter. Hydraulic modulators up to approx. 8.85 have diode in the pluggable printed-board assembly. Take measurements between K4/term.4 and K4/term.7.
If diode defective, exchange hydraulic modulator.
- Hydraulic modulators as of approx. 8.85 have diode in the valve relay. Take measurement at disconnected valve relay between the terminals 30 and L1.
If diode defective, exchange valve relay.
- * Test for contact resistance and open circuit in ground of valve relay. In units up to approx. 8.85:
From plug K3/term.8 to ground terminal.
In units as of approx. 8.85:
Disconnect valve relay and take measurement between term.87a and ground terminal at pump motor.



Top view of controller plug K1 (35-pin) with terminal numbers.
Arrow = Lug with mechanical encoding

Plug plate of hydraulic mod., position of terminals:
VR = Valve relay
MR = Motor relay
K4 = Wiring-harness plug



TEST STEP 2 (CONTINUED) (TEST SPECIFICATIONS AND OPERATING INSTRUCTIONS)

One or several LEDs 4 do not light up:

- * Measure internal resistance directly at hydraulic modulator.

Test specifications:

Valve l (LED 4.1) between K4/term.1 and K4/term.4: 0,7...1,7 Ω

Valve r (LED 4.2) between K4/term.3 and K4/term.4: 0,7...1,7 Ω

Valve h (LED 4.3) between K4/term.5 and K4/term.4: 0,7...1,7 Ω

- * If test specification not obtained:
Exchange hydraulic modulator.

- * Check lines for continuity (test specification: 0 Ω):

Valve l (LED 4.1) between K3/term.1
and controller plug K1/term.2

Valve r (LED 4.2) between K3/term.3
and controller plug K1/term.35

Valve h (LED 4.3) between K3/term.5
and controller plug K1/term.18

If test specification not obtained:

Check plug connection for open circuit, corrosion and mechanical defects. Eliminate open circuit.

3. All LEDs 4 and LEDs 3 do not light up:

- * Check ground of valve relay for contact resistance and open circuit.

For units up to approx. 8.85:

From plug K3/term.8 to ground terminal.

For units as of approx. 8.85:

Disconnect valve relay and take measurement between term. 87a
and ground terminal at pump motor.

- * Valve relay defective.

4. A LED lights up weakly:

- * This means there is contact resistance in the corresponding current path..

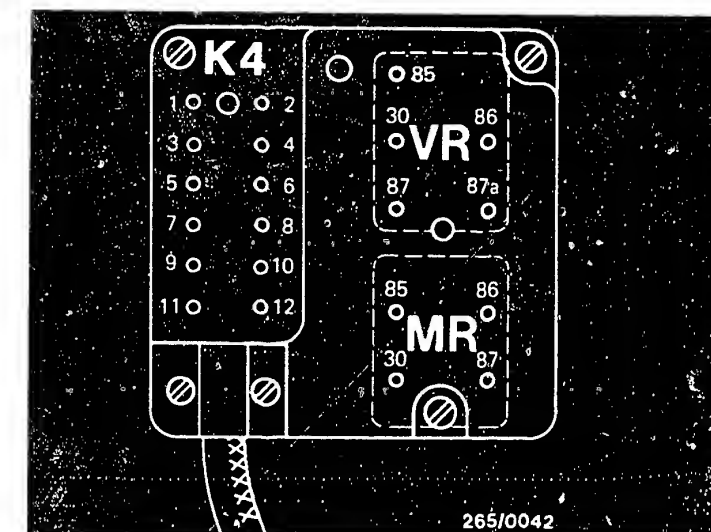
5. ABS warning lamp does not light up:

Warning lamp defective.

Check lead to driving switch term. 15 via 12-pin plug
connection and controller term.29.

Note:

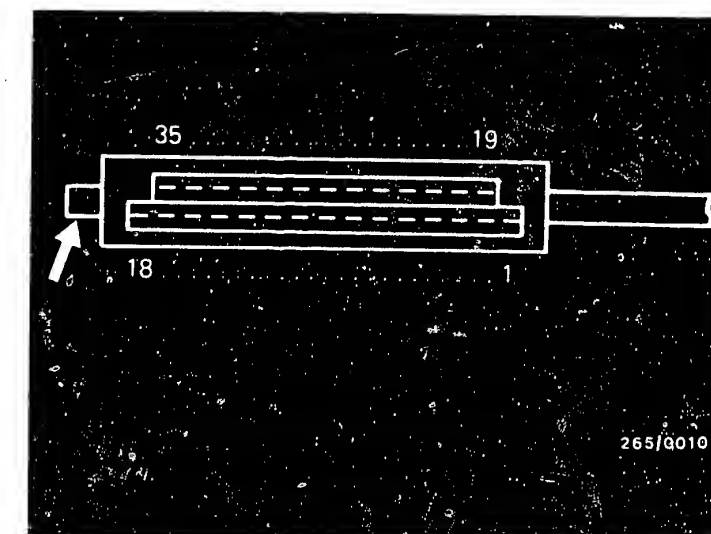
All the other 6 LEDs must light up.



Plug plate of hydraulic mod.,
position of terminals:
VR = Valve relay
MR = Motor relay
K4 = Wiring-harness plug

Top view of controller plug
K1 (35-pin) with terminal
numbers.

Arrow = Lug with mechanical
encoding



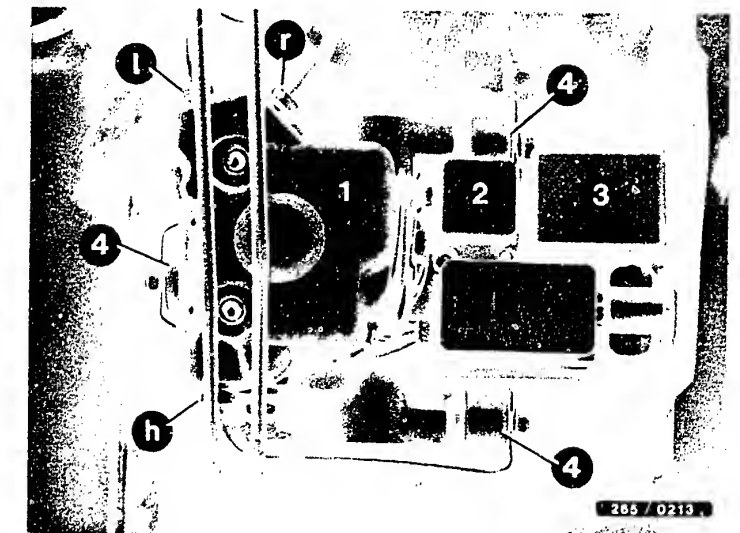
Removing the hydraulic modulator

- * For reasons of safety, the hydraulic modulator must not be repaired, but replaced only as a complete unit.

Excepted are the motor and valve relays.
Both relays may be replaced.

- * Excepting brake-line connections, no screws on the hydraulic modulator may be loosened.
In particular, the hexagon-socket-head cap screws or Torx screws must under no circumstances be loosened.
After loosening, the brake circuits can never be sealed again.
D a n g e r t o l i f e !

- * Make visual examination for leaks in hydraulic modulator and brake-line connections.
Pay particular attention to the sealing points indicated by arrows (upper illustration).
If brake fluid is escaping, tighten (12...16 Nm) or replace the brake-line connections, or replace the hydraulic modulator.



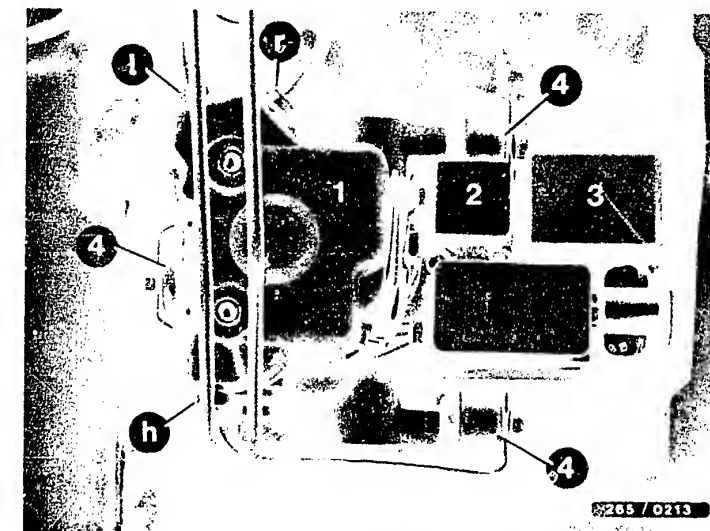
- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

At the base of the hydraulic modulator there is a ventilation hole to the pump plunger. It is possible that small amounts of brake fluid escape at this point. A complaint is only justified if a pool of brake fluid forms beneath the hydraulic modulator when the brake pedal is pressed several times.

* When removing and installing the brake lines ensure that the lines are marked in accordance with the marking on the hydraulic modulator and are reconnected in the correct order (e.g. "1" from the hydraulic modulator must be connected to the front-left wheel-brake cylinder).

* Marking on hydraulic modulator:

- l = Connection for front-left brake line (wheel-brake cylinder)
- r = Connection for front-right brake line (wheel-brake cylinder)
- h = Connection for brake line for rear axle
- V = Front-axle brake circuit from master brake cylinder
- H = Rear-axle brake circuit from master brake cylinder

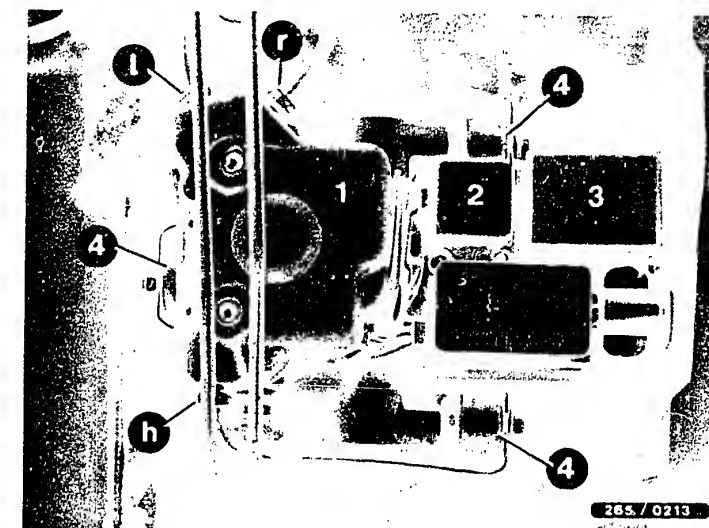


- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

- * Use only the specified double-head box wrench 9 x 11 mm for loosening and tightening the brake lines.
- * Code brake lines and loosen from hydraulic modulator.
- * Catch brake fluid and avoid contact with skin, clothing or paintwork!
- * Seal brake lines and connections immediately with dummy plugs.
- * Disconnect ground cable at pump motor.
- * Loosen fastening screw and remove cap.
- * Loosen hoop and remove plug.
- * Loosen hexagon nuts of bracket and remove hydraulic modulator.

Installation

- * Position hydraulic modulator into bracket and tighten with the hexagon nuts.
- * Connect ground cable to pump motor. Connect 13-pin plug and fasten with the hoop.
- * Tighten cap with screw on the hydraulic modulator.
- * Connect brake lines to hydraulic modulator according to coding.
- * Pay attention to tightening torque for brake-line connections at hydraulic modulator: 12...16 Nm.
- * Bleed brake system and check for leaks.
- * Thoroughly check ABS with tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

TEST STEP 3

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/Operation:

Generator voltage of term. 61
(term. 15)

* Operation:	Position:
Program switch	2
Push-button	-

* Operation in vehicle:
Ignition on.

* Test specification (indication):
LED 1 (upper illustration) lights up.

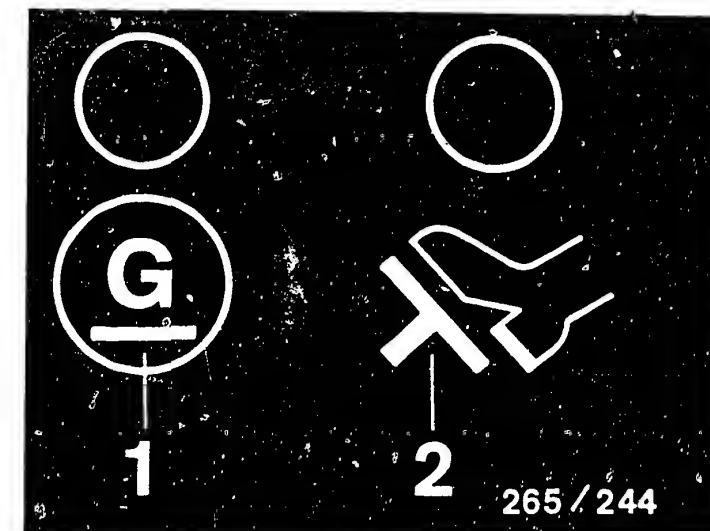
* Operation in vehicle:
Start engine.

* Test specification (indication):
LED 1 (upper illustration) goes out when engine running.

Trouble-shooting:

LED 1 does not go out when engine running:

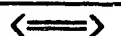
- * Briefly accelerate.
If LED 1 goes out, test is O.K.
- * Voltage measurement at K1/
term. 15 with engine running.
Test specification: greater than 10 V.
- * Oscilloscope measurement at K1/
term. 15 with engine running.
- * Voltage smaller than 10 V or
pattern indicating defects.
- * Repair generator and/or lead.



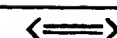
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C17



C18



Component/Operation:

Stop-lamp switch term. 25.

Operation:	Position:
Program switch	2
Push-button	-

* Operation in vehicle:
Ignition on.

* Test specification (indication):
LED 2 (upper illustration) lights up.

* Operation in vehicle:
Actuate brake pedal.

* Test specification (indication):
LED 2 (upper illustration) goes out.

Trouble-shooting:

1. LED 2 does not light up:

* Stop lamps defective.
High contact resistance of stop lamps or of their ground.
Break in line from controller term. 25 to stop-lamp switch.

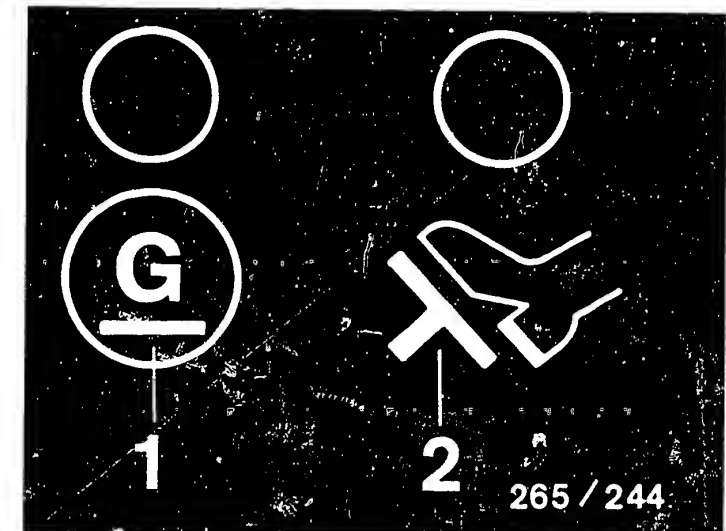
2. LED does not go out or becomes only slightly darker:

* Fuse for stop-lamp switch defective.

* Voltage drop at stop-lamp switch (switch defective) or its plug connections.

* Stop-lamp switch defective.

* Lead to stop-lamp switch connected incorrectly.



Continued on next coordinate

TEST STEP 4

(TEST SPECIFICATIONS AND NOTES ON OPERATION)

Component/Operation:

Pump-motor motor relay in hydraulic modulator (term.28, term.14).

* Operation:	Position:
Program switch	3
Push-button (upper ill.)	2

* Operation in vehicle:
Ignition on.
Keep push-button 2 (upper ill.) pressed.

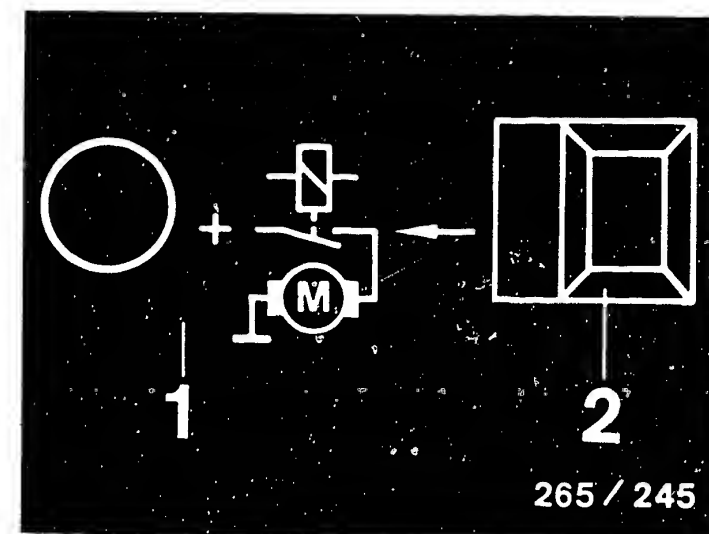
* Test specification (indication):
LED 1 lights up, pump motor runs.

After releasing the push-button, LED 1 stays lit due to run-on of motor (upper illustration).

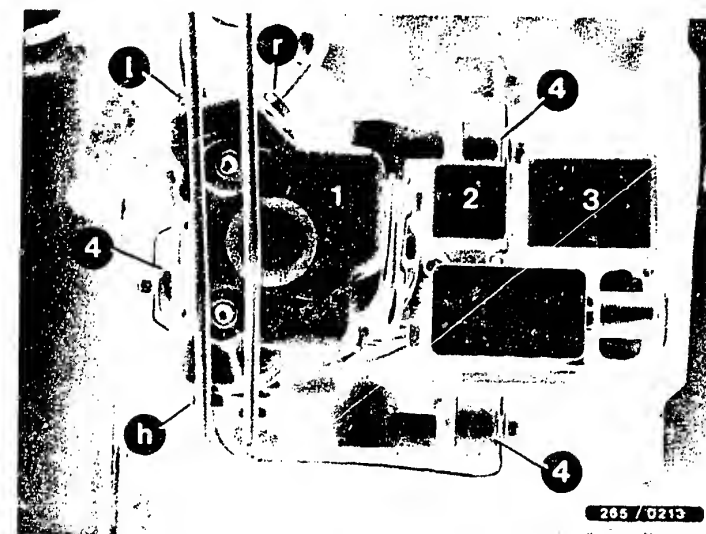
Trouble-shooting:Switch off ignition:

1. LED does not light up or pump motor does not start:

* Motor relay defective (lower illustration).



1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay
4 = Fastening nuts



Continued D03

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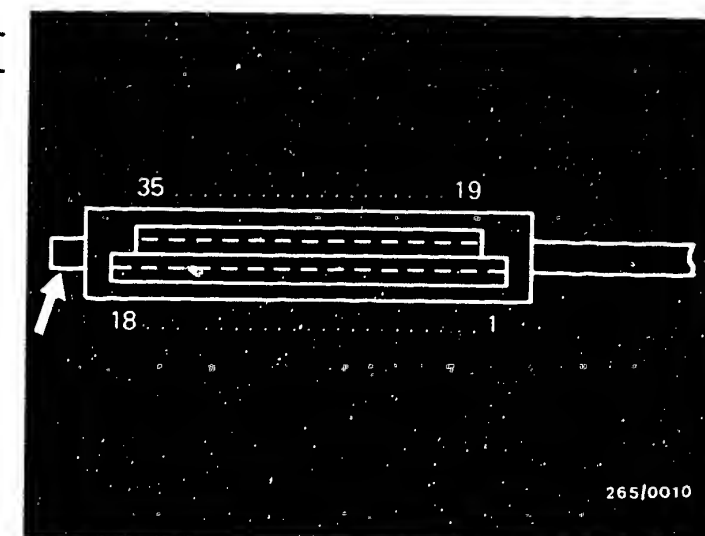
C21

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C22

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- * Check following leads for continuity:
 - From controller plug K1/term.14 to plug K3/term.9.
 - From K4/term.9 to motor relay term.30.
 - From over-voltage protection relay term.87 (4) to plug K3/term.10.
 - From plug plate K4/term.10 to motor relay term.86.
 - From motor relay term.85 to K4/term.11.
 - From K3/term.11 to controller plug K1/term.28.
 - From motor relay term.87 to K4/term.12.
 - From K3/term.12 to term.B+.

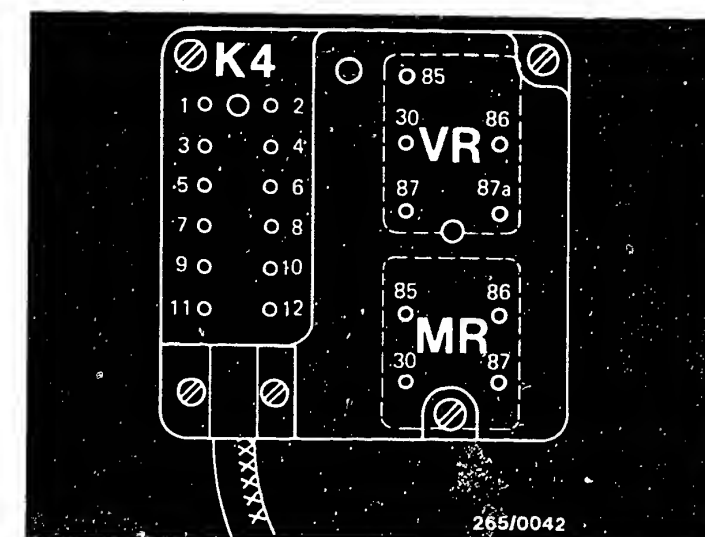


Top view of controller plug K1 (35-pin) with terminal numbers.
Arrow = Lug with mechanical encoding

2. Pump motor does not run or LED does not stay lit or very briefly stays lit:

- * Check for firm seating of and contact resistance in ground terminal of pump motor.
- * Check for firm seating of positive connection of pump motor.
Check lead from positive connection of pump motor to motor relay term.30.
Check pump motor for continuity.
- * Pump motor defective: exchange hydraulic modulator.

Plug plate of hydraulic mod.,
position of terminals:
VR = Valve relay
MR = Motor relay
K4 = Wiring-harness plug



Removing the hydraulic modulator

- * For reasons of safety, the hydraulic modulator must not be repaired, but replaced only as a complete unit.

Excepted are the motor and valve relays.
Both relays may be replaced.

- * Excepting brake-line connections, no screws on the hydraulic modulator may be loosened.

In particular, the hexagon-socket-head cap screws or Torx screws must under no circumstances be loosened.

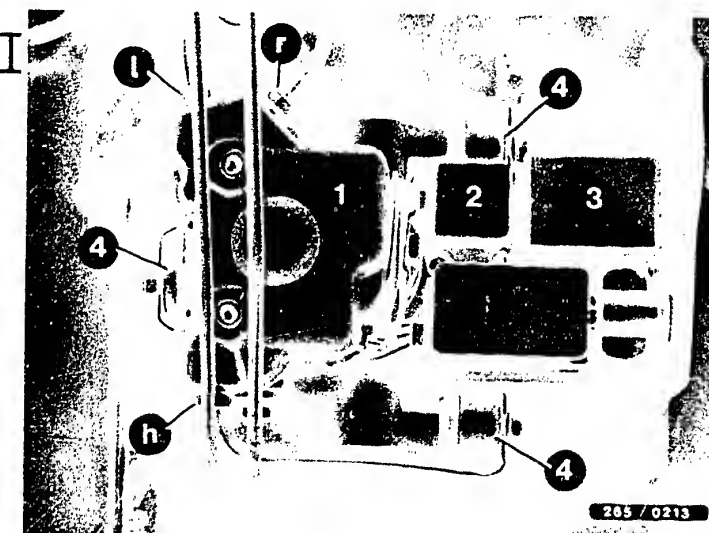
After loosening, the brake circuits can never be sealed again.

Danger to life !

- * Make visual examination for leaks in hydraulic modulator and brake-line connections.

Pay particular attention to the sealing points indicated by arrows (upper illustration).

If brake fluid is escaping, tighten (12...16 Nm) or replace the brake-line connections, or replace the hydraulic modulator.



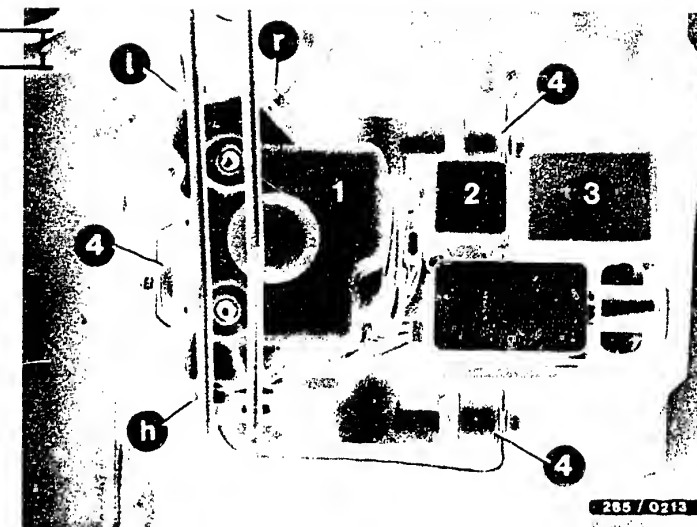
1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay
4 = Fastening nuts

At the base of the hydraulic modulator there is a ventilation hole to the pump plunger. It is possible that small amounts of brake fluid escape at this point. A complaint is only justified if a pool of brake fluid forms beneath the hydraulic modulator when the brake pedal is pressed several times.

* When removing and installing the brake lines ensure that the lines are marked in accordance with the marking on the hydraulic modulator and are reconnected in the correct order (e.g. "1" from the hydraulic modulator must be connected to the front-left wheel-brake cylinder).

* Marking on hydraulic modulator:

- l = Connection for front-left brake line (wheel-brake cylinder)
- r = Connection for front-right brake line (wheel-brake cylinder)
- h = Connection for brake line for rear axle
- V = Front-axle brake circuit from master brake cylinder
- H = Rear-axle brake circuit from master brake cylinder

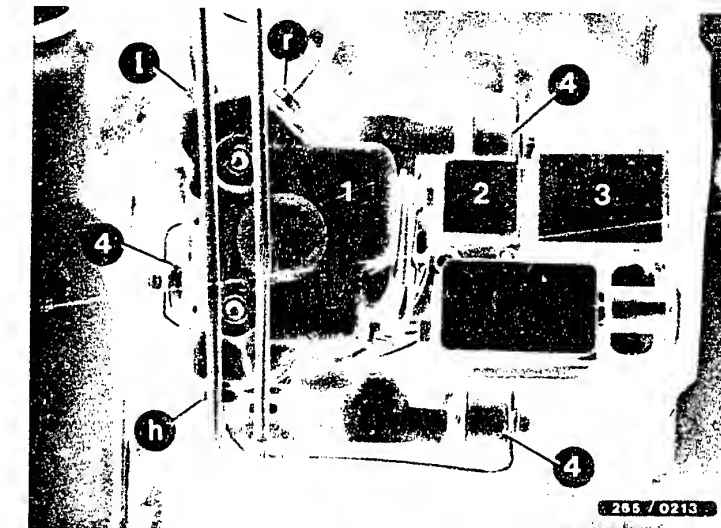


- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

- * Use only the specified double-head box wrench 9 x 11 mm for loosening and tightening the brake lines.
- * Code brake lines and loosen from hydraulic modulator.
- * Catch brake fluid and avoid contact with skin, clothing or paintwork!
- * Seal brake lines and connections immediately with dummy plugs.
- * Disconnect ground cable at pump motor.
- * Loosen fastening screw and remove cap.
- * Loosen hoop and remove plug.
- * Loosen hexagon nuts of bracket and remove hydraulic modulator.

Installation

- * Position hydraulic modulator into bracket and tighten with the hexagon nuts.
- * Connect ground cable to pump motor. Connect 13-pin plug and fasten with the hoop.
- * Tighten cap with screw on the hydraulic modulator.
- * Connect brake lines to hydraulic modulator according to coding.
- * Pay attention to tightening torque for brake-line connections at hydraulic modulator: 12...16 Nm.
- * Bleed brake system and check for leaks.
- * Thoroughly check ABS with tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

Test step for program-switch position 4 not applicable.

Component/Operation:
N

Valve-relay operation term. 27

* Operation:	Position:
Program switch	5
Push-button	-

*** Operation in vehicle:**
Ignition on.

*** Test specification (indication):**
LED 3 (upper illustration)
lights up.

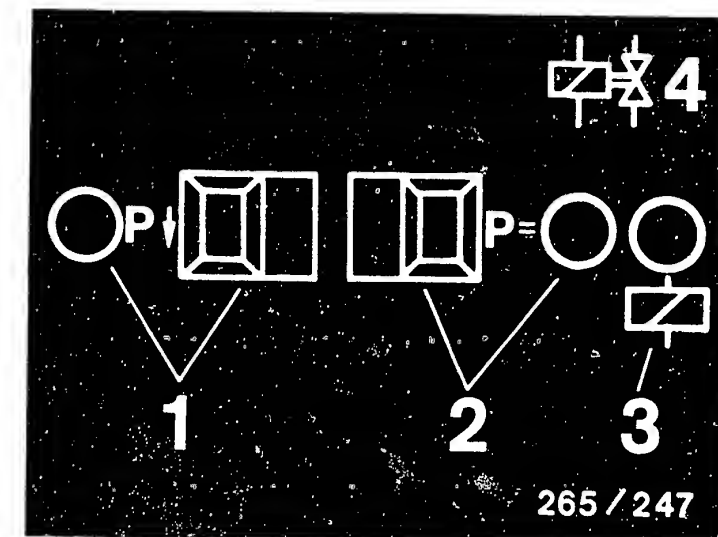
Trouble-shooting:

Switch off ignition.

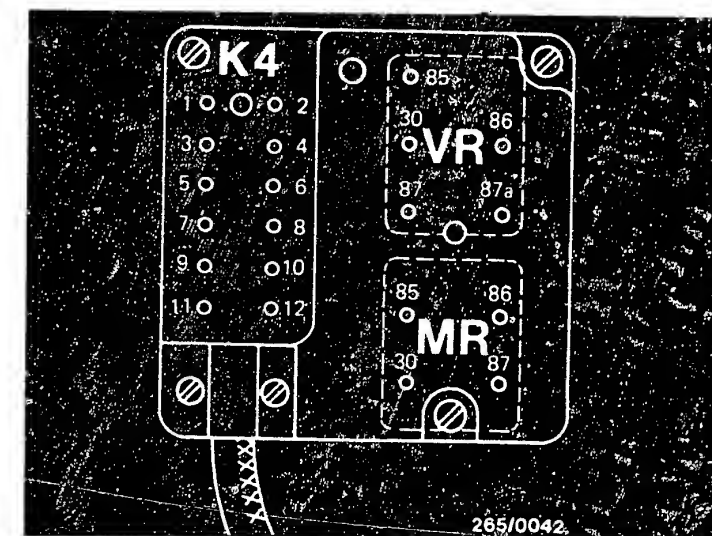
No indication:

- * Check the following leads for short circuit and contact resistance:
- From K1/term. 27 to K3/term. 2.
- From K1/term. 32 to K3/term. 4.
- From K4/term. 4 to valve relay term. 30.
- From K4/term. 2 to valve relay term. 85.
- From K4/term. 6 to valve relay 87.
- From K3/term. 6 to B+.
- From valve relay term. 86 to motor relay term. 86.

*** Valve relay defective: exchange.**



Plug plate of hydraulic mod.,
position of terminals:
VR = Valve relay
MR = Motor relay
K4 = Wiring-harness plug



Continued on next coordinate

Continued on next coordinate

Component/Operation:

Check operation and for mix-up of solenoid-operated valves in hydraulic modulator.

Pressure-holding function
point 1 to 3 and
Pressure-release function
point 4 to 5.

Note:

Check each wheel separately in turn, observe operating sequence.

* Operation: Position:
Program switch 5

* Operation in vehicle and at tester:

Chock up vehicle. The wheel being tested must be freely turnable by hand.

Ignition on.

Set switch 1 (upper ill.) for wheel selection to wheel to be tested.

1. (Lower illustration)

Push-button P = keep pressed

Test specification:

LED P = lights up.

1. LED P (lower illustration) does not light up:

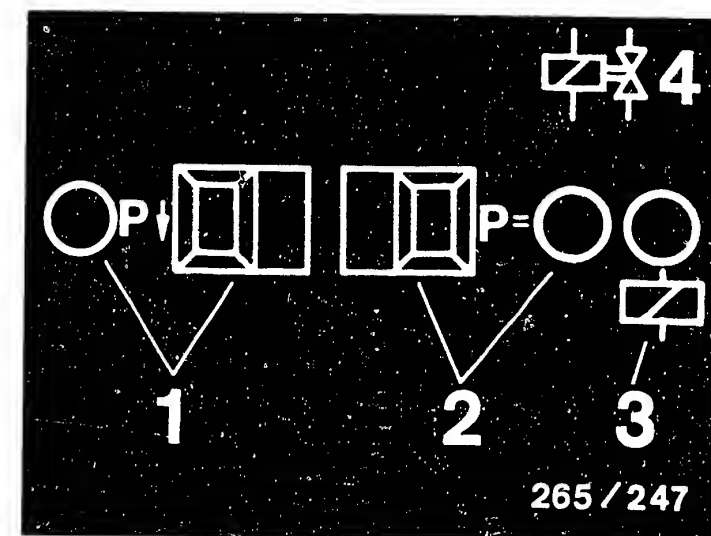
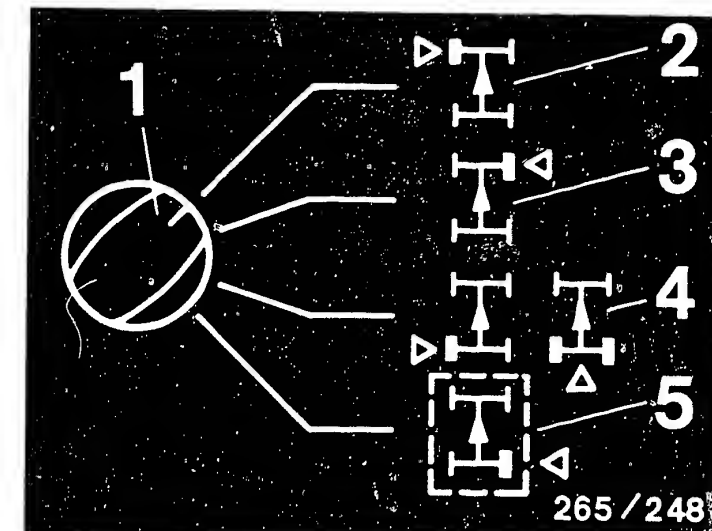
- * Battery insufficiently charged.
- * Repeat test with engine running.
- * Valve relay (make contact) defective.
- * Ground terminals must be bare and connected firmly.

Check the following leads for voltage drop and open circuit.

- * Ground cable from K1/term. 10 to ground.
- * Lead from controller plug K1/term. 34 to ground.
- * Positive lead from plug K1/term. 1 to over-voltage protection relay term. 87 (4).
- * Lead from valve relay term. 87 to B+.

Continued on next coordinate

Continued on next coordinate



2. Constantly press brake pedal.

Test specification:
Wheel turnable by hand.

3. Release push-button P=.
(upper illustration)

Test specification:
LED P= goes out,
wheel locks.

Pressure reduction:

4. Press push-button P arrow
(upper illustration)

Test specification:
LED P arrow lights up,
Wheel turnable by hand.

5. Release push-button P arrow
(upper illustration)

Test specification:
LED P arrow goes out,
wheel locks.

6. Release brake pedal.

Continued on next coordinate

2. Wheel locks or wheel can not
be turned:

- * Hydraulic brake lines at hydraulic modulator (lower illustration) mixed up.
- * Solenoid-operated valves correctly electrically connected?

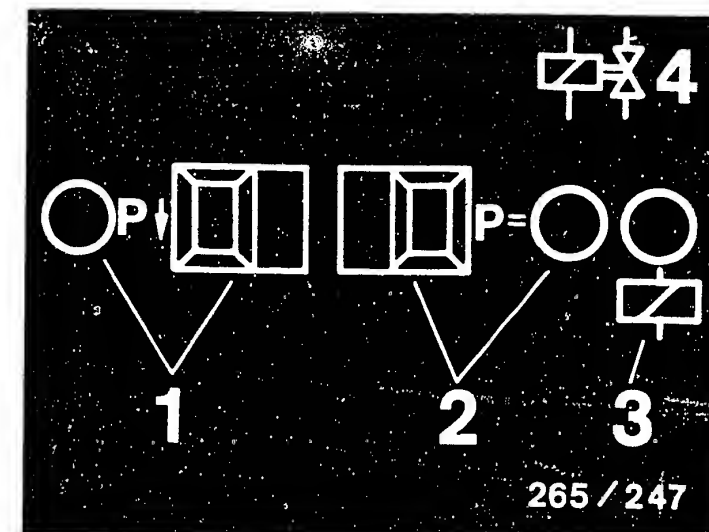
Wheel, front left:
from plug K1/term. 2 to K3/
term. 3.

Wheel, front right:
from plug K1/term. 35 to K3/
term. 1.

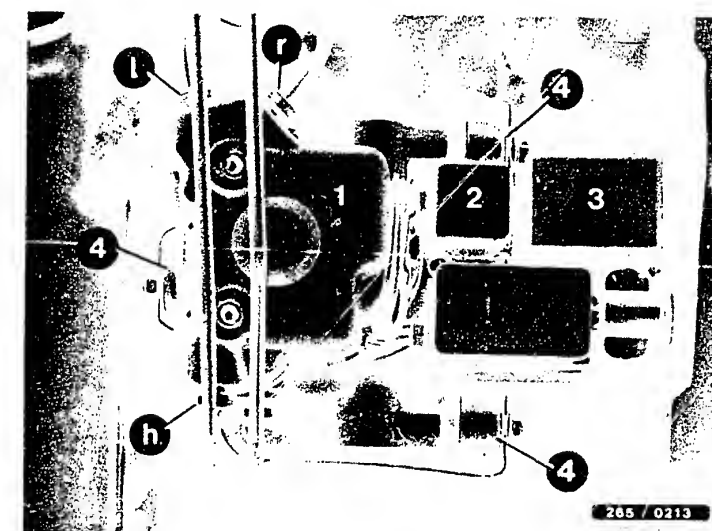
Rear axle:
from plug K1/term. 18 to K3/
term. 5.

- * Check for firm seating of ground strap of pump.
Clamping points must be bare.
- * Check positive connection of pump for voltage drop and firm seating.
Connection must be bare and firmly connected.
- * Hydraulic modulator defective.

Continued on next coordinate



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts



Removing the hydraulic modulator

- * For reasons of safety, the hydraulic modulator must not be repaired, but replaced only as a complete unit.

Excepted are the motor and valve relays.
Both relays may be replaced.

- * Excepting brake-line connections, no screws on the hydraulic modulator may be loosened.

In particular, the hexagon-socket-head cap screws or Torx screws must under no circumstances be loosened.

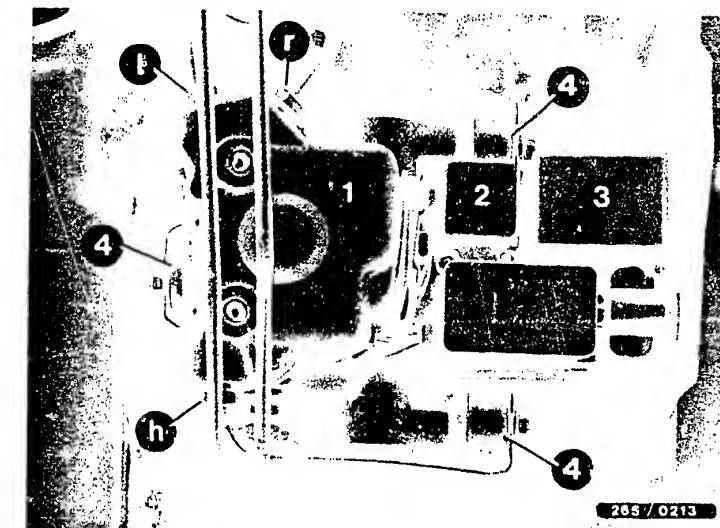
After loosening, the brake circuits can never be sealed again.

D a n g e r t o l i f e !

- * Make visual examination for leaks in hydraulic modulator and brake-line connections.

Pay particular attention to the sealing points indicated by arrows (upper illustration).

If brake fluid is escaping, tighten (12...16 Nm) or replace the brake-line connections, or replace the hydraulic modulator.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

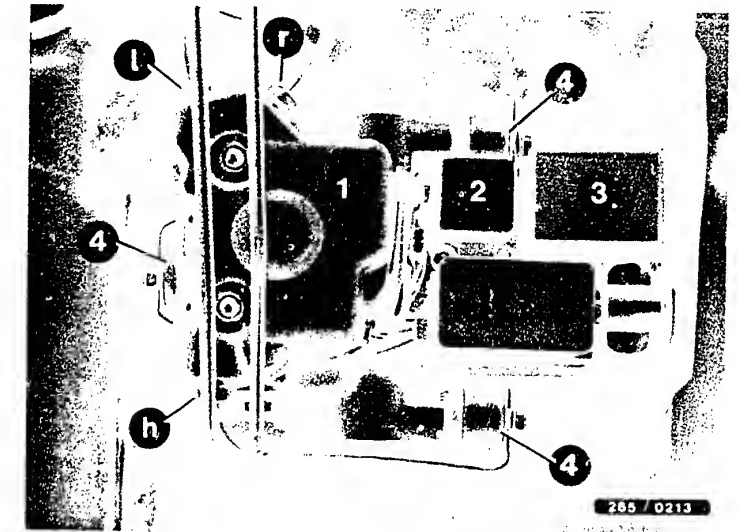
TEST STEP 5 (CONTINUED) (TEST SPECIFICATIONS AND OPERATING INSTRUCTIONS)

At the base of the hydraulic modulator there is a ventilation hole to the pump plunger.
It is possible that small amounts of brake fluid escape at this point.
A complaint is only justified if a pool of brake fluid forms beneath the hydraulic modulator when the brake pedal is pressed several times.

* When removing and installing the brake lines ensure that the lines are marked in accordance with the marking on the hydraulic modulator and are reconnected in the correct order (e.g. "1" from the hydraulic modulator must be connected to the front-left wheel-brake cylinder);

* Marking on hydraulic modulator:

- l = Connection for front-left brake line (wheel-brake cylinder)
- r = Connection for front-right brake line (wheel-brake cylinder)
- h = Connection for brake line for rear axle
- V = Front-axle brake circuit from master brake cylinder
- H = Rear-axle brake circuit from master brake cylinder

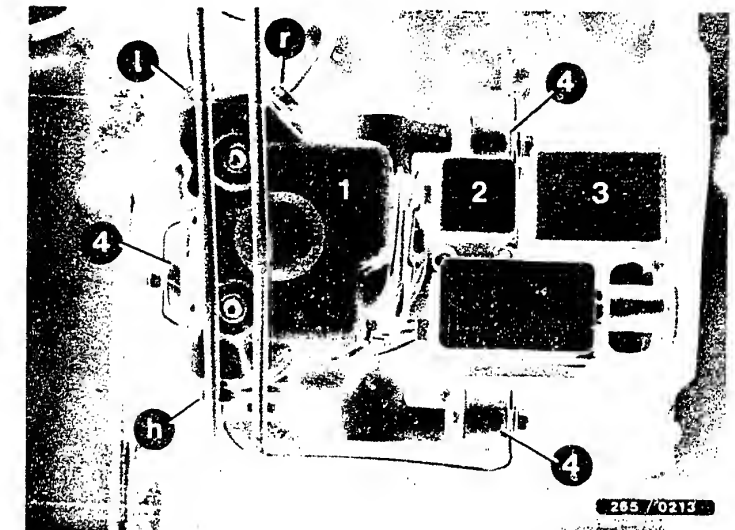


- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

- * Use only the specified double-head box wrench 9 x 11 mm for loosening and tightening the brake lines.
- * Code brake lines and loosen from hydraulic modulator.
- * Catch brake fluid and avoid contact with skin, clothing or paintwork!
- * Seal brake lines and connections immediately with dummy plugs.
- * Disconnect ground cable at pump motor.
- * Loosen fastening screw and remove cap.
- * Loosen hoop and remove plug.
- * Loosen hexagon nuts of bracket and remove hydraulic modulator.

Installation

- * Position hydraulic modulator into bracket and tighten with the hexagon nuts.
- * Connect ground cable to pump motor. Connect 12-pin plug and fasten with the hoop.
- * Tighten cap with screw on the hydraulic modulator.
- * Connect brake lines to hydraulic modulator according to coding.
- * Pay attention to tightening torque for brake-line connections at hydraulic modulator: 12...16 Nm.
- * Bleed brake system and check for leaks.
- * Thoroughly check ABS with tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Motor relay
- 4 = Fastening nuts

Component/Operation:

Checking the wheel-speed sensors for operation and mix-up.

Note:

Check each wheel separately in turn. The rear axle can be checked at either the left or right wheel.

* Operation: Position:
Program switch 6

* Operation in vehicle and tester:

Chock up vehicle.

Ignition on.

The wheel to be tested must be freely turnable by hand. When testing the driven axle, the wheel not being tested must be locked.

Set the switch for wheel selection to the wheel to be tested (upper illustration).

Turn the wheel by hand until LED 2 above the instrument lights up without flickering. (Speed approx. 1 revolution per second).

Trouble-shooting:

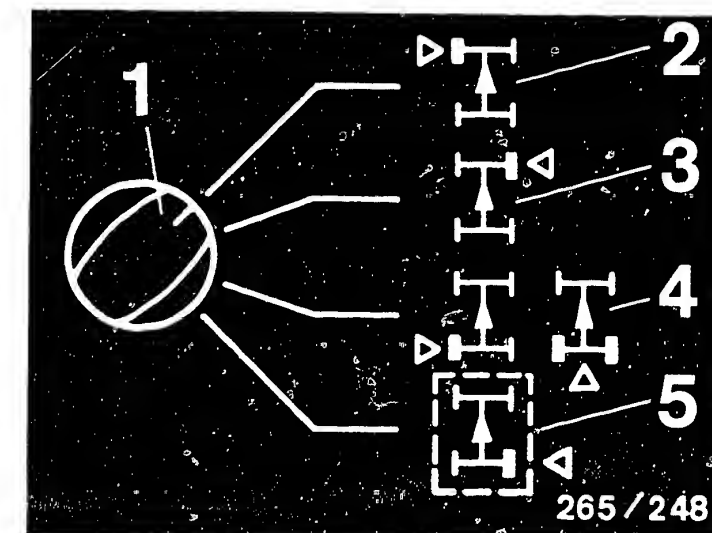
1. LED (lower illustration) does not light up.

- * Wheel speed too low or too high.
- * Drive speed of the wheel too low or too high.
- * Ring gear with incorrect number of teeth or ring gear missing or loose.

* Number of teeth:
Front axle: 48 teeth
Rear axle:
Differing number of teeth on propshaft depending upon transmission ratio.

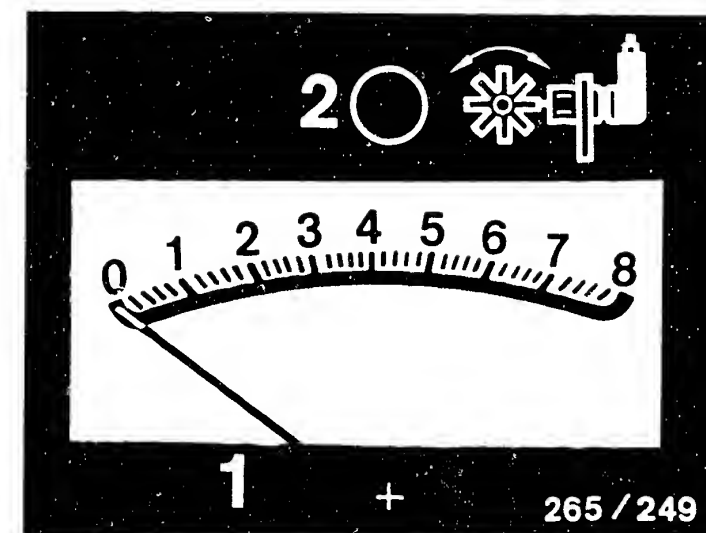
2. LEDs light up and instrument indicates in incorrect switch position:

- * Plug connections of wheel-speed sensors mixed up.
- * Leads at plug K1 incorrectly connected.
- * Check terminal assignment in accordance with terminal diagram.



- 1 = Wheel selector switch
2 = Wheel, front left
3 = Wheel, front right
4 = Wheel, rear left
or rear axle
5 = Wheel, rear right

- 1 = Instrument
2 = LED for wheel speed



Continued on next coordinate

Continued on next coordinate

TEST STEP 6 (CONTINUED) (TEST SPECIFICATIONS AND OPERATING INSTRUCTIONS)

Then read off reading at instrument.

Test specification (reading).

- * Smallest reading = larger 1,0 divisions.
- * Permissible fluctuation max. 25 % of greatest reading.

Ignition off.

3. No reading at instrument:

- * Check wheel-speed sensor for open circuit. Disconnect plug connection and measure the winding resistance using ohmmeter:

TEST SPECIFICATION:

Front axle:

→ 4.85: 0.9...2.3 k Ω

4.85 →: 0.6...1.6 k Ω

Rear axle:

0.6...1.6 k Ω

The following wheel-speed-sensor leads for open circuit.

- * Wheel, front left: From controller plug K1/term. 6 and term. 4 to plug connection K11.
- * Wheel, front right: From controller plug K1/term. 23 and term. 21 to plug connection K13.
- * Rear axle: From controller plug K1/term. 7 and term. 9 to plug connection K15.



Arrow = Wheel-speed-sensor plug connection, front right

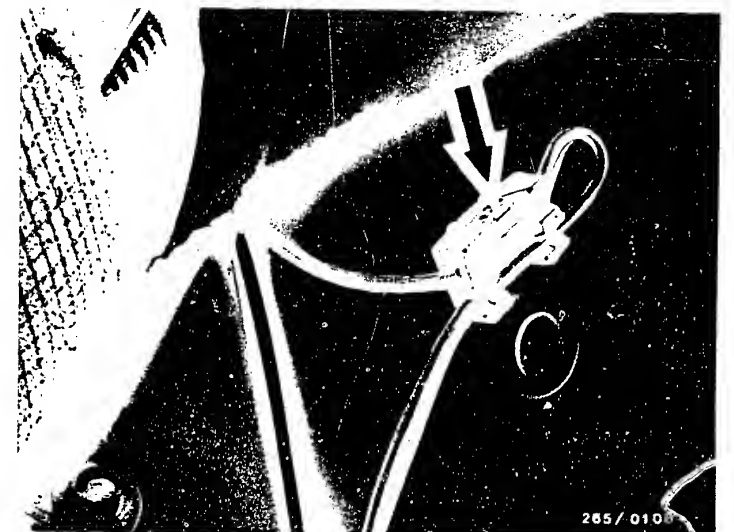
Take for a road test for final check.

Warning lamp must go out with engine running.

Drive at at least 30 km/h. Warning lamp must not light up again.

If no fault can be found with the LED tester, check for loose contacts or rubbed locations in the leads, or exchange controller.

Arrow = Wheel-speed-sensor plug connection, rear



Continued on next coordinate

4. Indication smaller than or approx. 1.0:

- * Air gap between wheel-speed sensor and ring gear too wide.
- * Nominal dimension 0.8 mm.
- * Ring gear defective or loose or with incorrect number of teeth.

* Front axle: 96 teeth

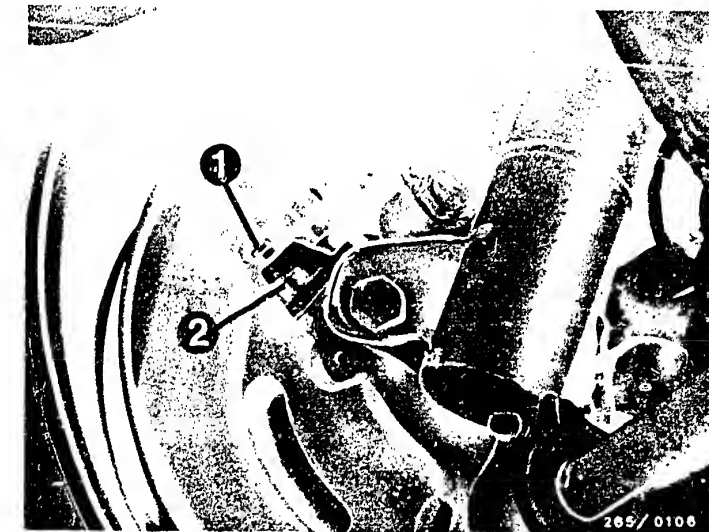
Rear axle:

Different number of teeth on Cardan shaft depending upon transmission ratio.

- * Wheel-speed sensor defective: exchange.

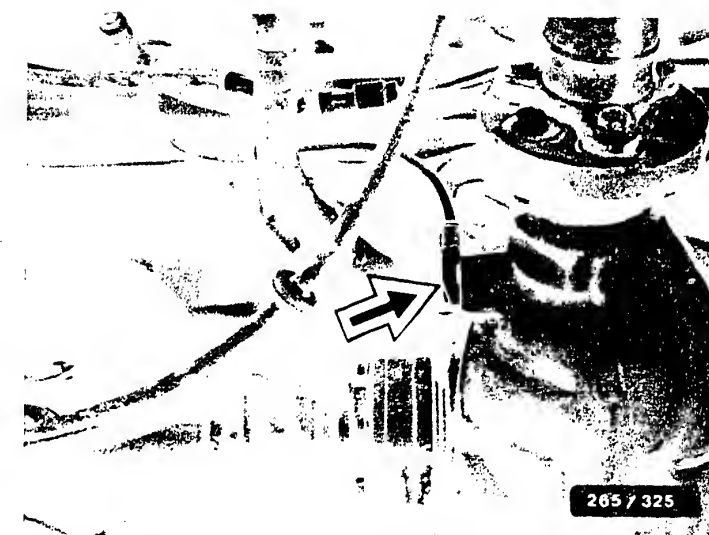
5. Fluctuation too great:

- * Wheel-bearing clearance too great.
- * Ring gear defective.
- * Ring gear out of round.



1 = Wheel-speed sensor, front axle
2 = Mounting plate

Arrow = Wheel-speed sensor rear axle



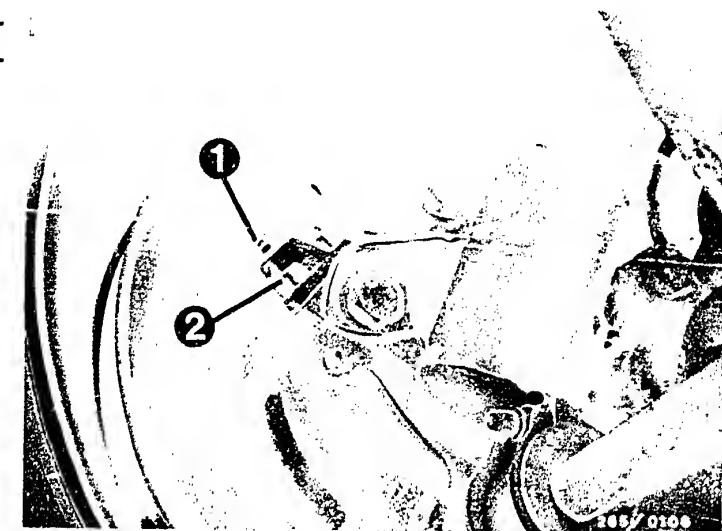
Continued on next coordinate

Removing the wheel-speed sensors:

- * The plug connections for the front axle are positioned in the engine compartment and those for the rear axle beneath the rear seat bench on the right-hand side.
- * Take plug connection from mounting and disconnect.
- * Loosen fastening screw for wheel-speed sensor and carefully remove wheel-speed sensor.
Do not use force!

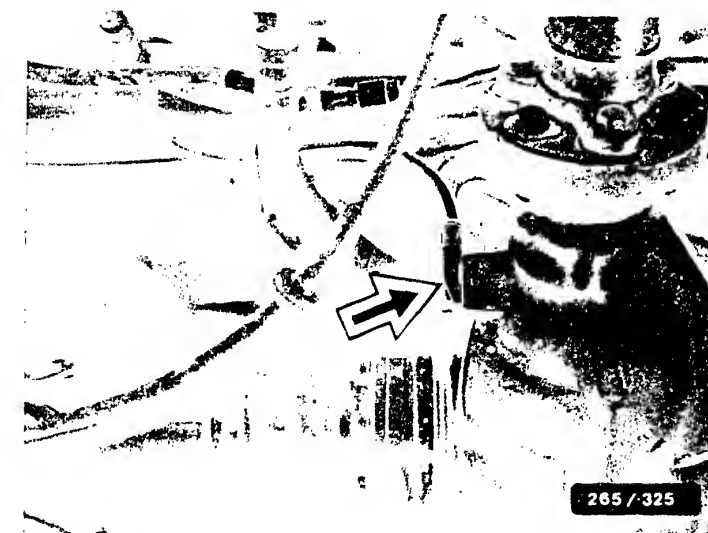
Installing the wheel-speed sensors:

- * Check O-ring for cracks and replace if necessary.
- * Do not remove the new wheel-speed sensor from the protective sleeve until it is to be assembled.
- * Slightly lubricate the wheel-speed-sensor housing using Molykote Longterm 2 lubricant.
- * Make certain that there are no metallic foreign bodies at the permanent-magnet edge.
- * Press wheel-speed sensor carefully as far as it will go into locating bore. Do not use excessive force!
- * Use new micro-encapsulated fastening screws.
Tightening torque:
For wheel-speed sensors with mounting plate: 22 Nm.
For wheel-speed sensors without mounting plate: 6...8 Nm.
- * Re-secure lead to the positions provided.
- * Connect wheel-speed sensor to ABS wiring harness and clip plug connection into holder.
- * After repairing, test using LED tester.



1 = Wheel-speed sensor, front axle
2 = Mounting plate

Arrow = Wheel-speed sensor rear axle



REPAIR PROHIBITION /
MAXIMUM ALLOWABLE STORAGE TIME
FOR ABS HYDRAULIC MODULATORS

13....39
VDT-I-265/102 En
1.1986

Replaces edition of 7.1984

1. Repair prohibition

ABS for passenger vehicles is a safety system.

Unauthorized tampering with ABS components brings with it the danger of impairment of the proper functioning of the ABS system.

* For reasons of safety, therefore, the
* hydraulic modulator may under no circum-
* stances be repaired, but instead must be
* exchanged as a complete unit.

Only the engine and valve relays may be exchanged.

No other screws or plugs may be loosened or removed.

2. Maximum allowable storage time

The maximum allowable storage time for hydraulic modulators is 5 years from the date of manufacture (FD) specified on the product.

This requires that the following storage conditions be fulfilled:

- Hydraulic modulator filled with brake fluid (supplied in filled condition).
- Vertical/upright position (hood on top).
- Ambient temperature between -20°C and +50°C.
- Dry storage.

After 5 years storage time, all rubber and plastic parts must be replaced and the hydraulic modulator must be subjected to a functional test.

The replacement of rubber and plastic parts and the functional test can be carried out only at the place of manufacture. After testing, the hydraulic modulators are marked with **LL** and a new date of manufacture (FD).

Service workshops in the Federal Republic of Germany should send the hydraulic modulators to:

Robert Bosch GmbH Abt. K1/VAK 2,
Robert-Bosch-Straße, 7141 Schwieberdingen.

Service workshops in other countries are requested to send the hydraulic modulators to:

Robert Bosch GmbH, KH/LAV 2 - Auspackraum,
z.W. on K1/VAK 2, Auf der Breit 4,
D-7500 Karlsruhe 41
West Germany.

The hydraulic modulators should be sent to us pre-paid. Please refer to this Technical Bulletin on the enclosed delivery ticket.

A fee is charged for parts replacement and functional testing.

Responsible:

ROBERT BOSCH GMBH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please address questions and comments concerning the contents to our authorized representative in your country.

TABLE OF CONTENTS

Section	Coordinates
Structure of microcard.....	A01
Special features.....	A02
Test specifications.....	A03-A04
Rapid diagnosis chart with ABS2 LED tester.....	A05-A16
Electrical terminal diagram.....	A17-A20
Test equipment and tools.....	A21-A22
Installation position of components.....	A24
Leakage check.....	A25
General information.....	A26-A28
Trouble-shooting:	
Check ABS warning lamp.....	B01-B03
Operation of the ABS2 LED tester.....	B04-B06
Test requirements.....	B07-B11
Test chart with ABS2 LED tester.....	C01-D22
Technical Bulletins.....	N01-N02

For production reasons:
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coordinate.

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